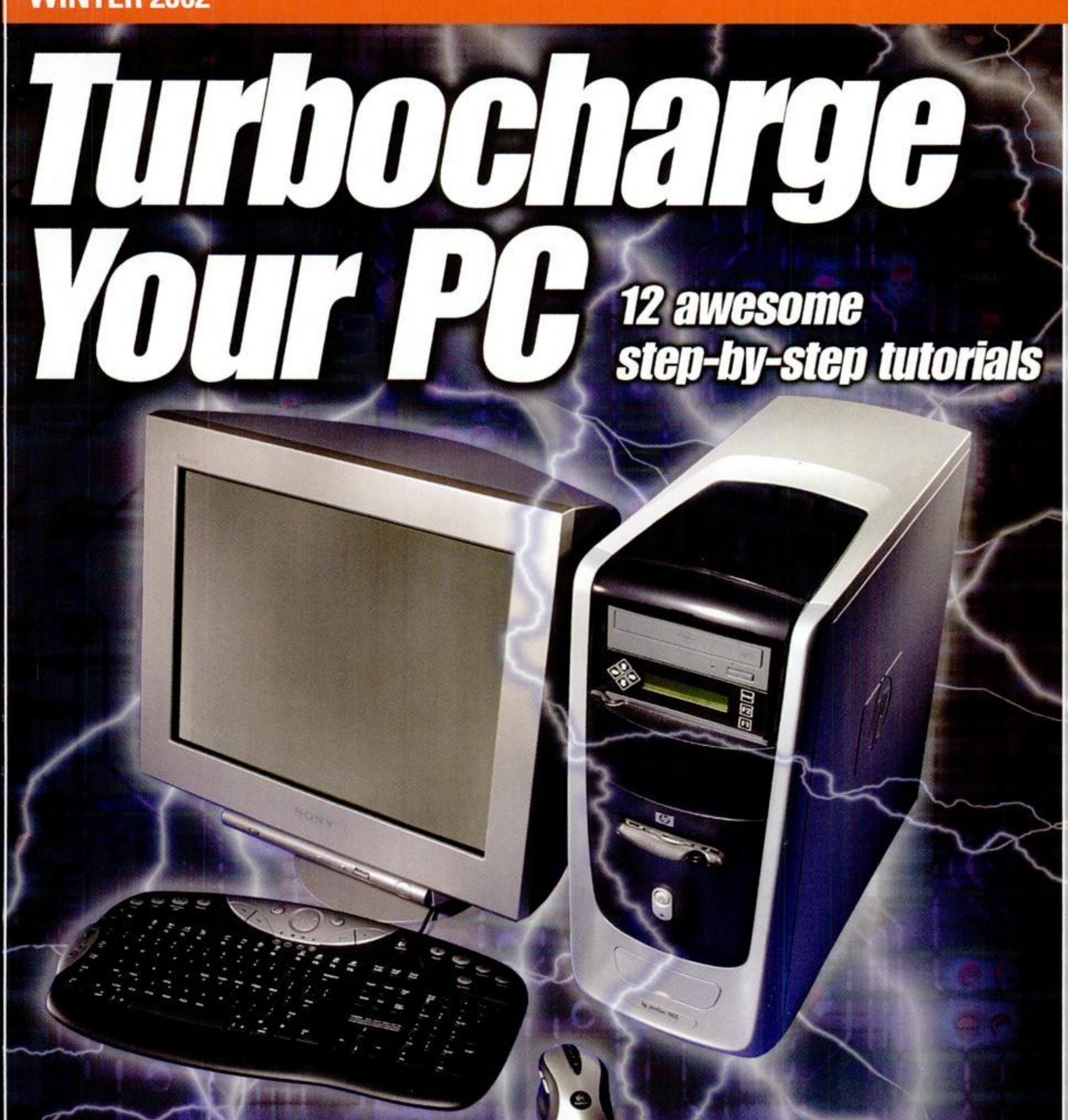
MAXIMUM PC PRESENTS THE ULTIMATE...

PC HOW-TO GUIDE

WINTER 2002

Turbocharge Your PC

12 awesome step-by-step tutorials



HOW TO:

- Uncover WinXP's Best-Kept Secrets
- Tweak Your BIOS
- Overclock Your Sluggish CPU
- Test Your PC Airflow
- Choose the Best Cooling Device
- Master PC Security
- Paint Your Case Like the Pros
- Build a 3D Model
- Create a Feature-Length DV Movie
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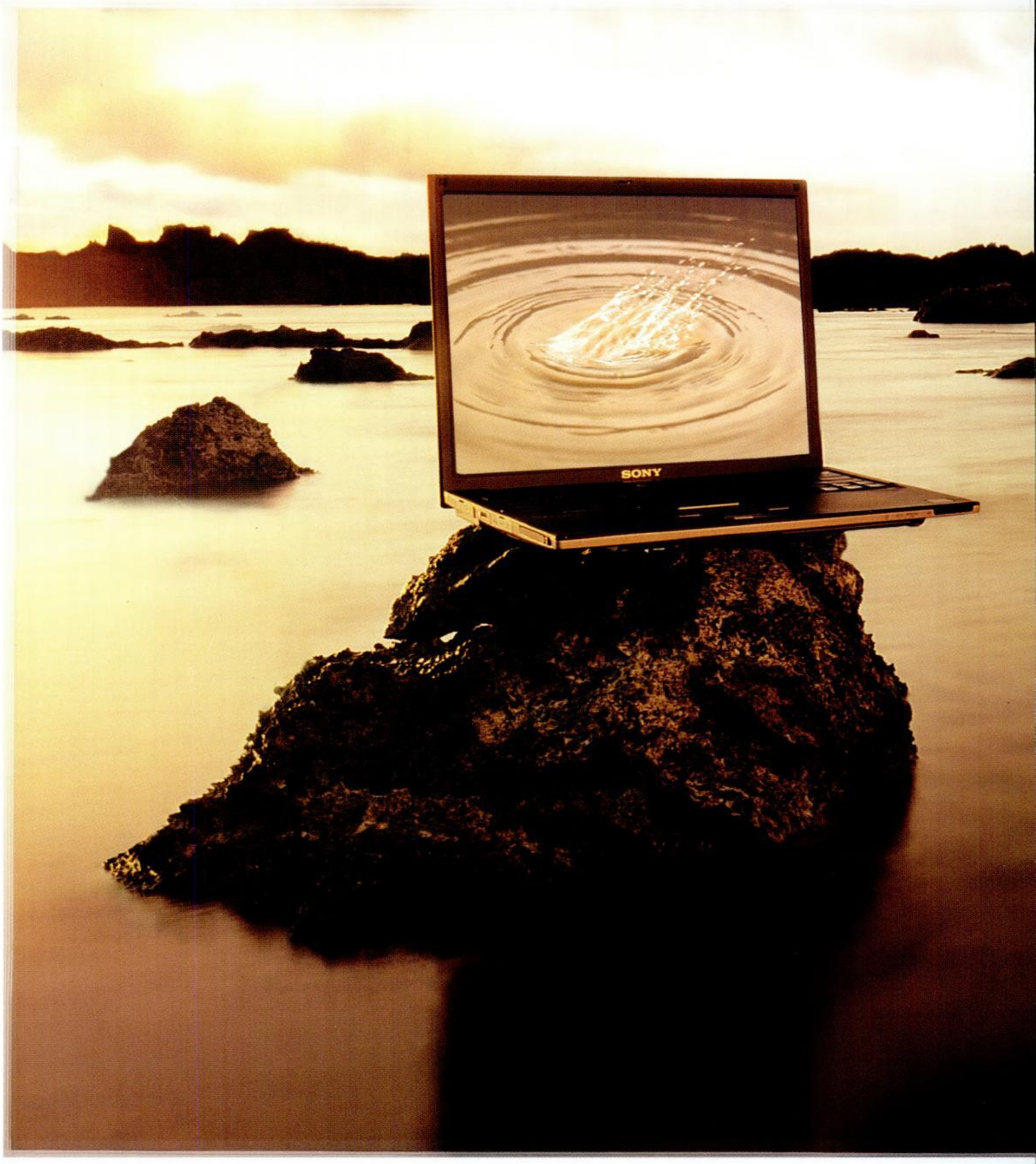

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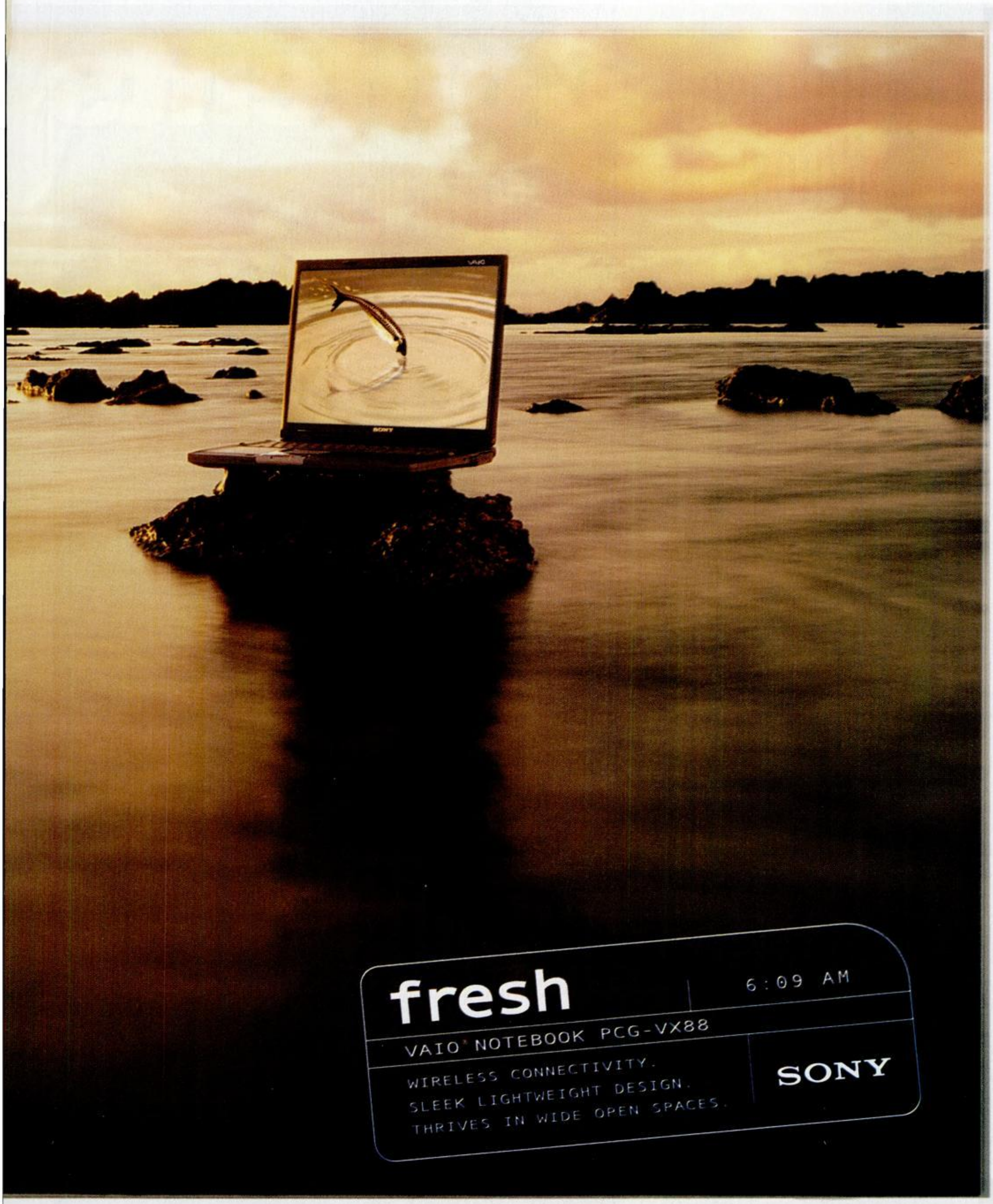

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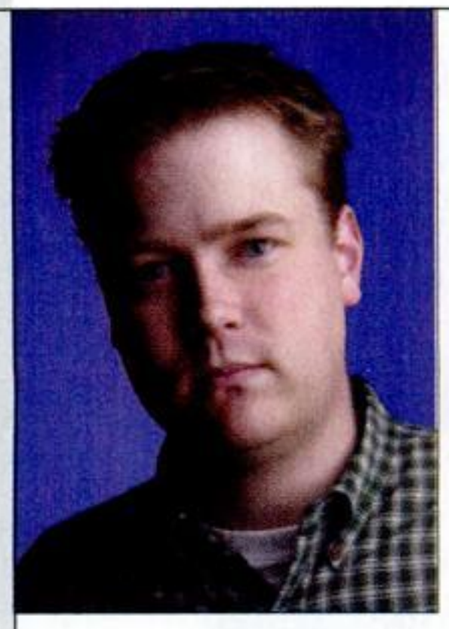

Release Notes

Brought to You by Popular Demand

Hi, I'm Will Smith, technical editor of *Maximum PC* Magazine. I'm the guy who assigns, edits, and occasionally even writes the how-to stories for our monthly mag—and my work load is only increasing. It seems our readers are looking to squeeze every last penny from their PC investments, so *Maximum PC*-style do-it-yourself articles are in greater demand than ever before.

Take our February and March cover stories: "Build Your Own PC" and "Give Windows XP a Clean Start" detailed everything you need to know about building a rig from scratch and creating custom rescue disks for your WinXP system. These cover stories were our best-selling issues of all time.

So what does this tell us? It tells us it's high time for the *Ultimate PC How-To Guide*, that's what it tells us!

On the following pages, we've assembled 12 killer step-by-steps to show you how to get the most from your PC. Whether you want to overclock your CPU, paint your case, or take control of your digital photos, we'll tell you everything you need to know to get the job done. We even rated our stories according to their difficulty level. Everyone should be able to complete the "easy" how-tos, but only experienced PC tinkerers should jump head-first into our "hard" stories. As for our XXX-rated articles, you should be either a hardcore PC fanatic or someone with a lot of spare time.

This special issue also contains some pure reference material that readers have been requesting for a long time. We've included six full pages of our best Ask the Doctor answers, as well as specs and lab notes for the most popular motherboard chipsets and CPUs. If you want to know what speed your Athlon XP 2400 really is, we've got the 411.

Finally, we present the most application-filled Maximum CD we've ever created. It's got more than 30 apps, demos, and games, the vast majority of which play key roles in the how-to stories you're about to read. We even tossed in PDF versions of our three most-often-requested how-to reprints.

Take a look at what we've got, and if you have an idea for a how-to story you'd like to see in our regular monthly magazine, feel free to fire an e-mail to wsmith@maximumpc.com.

—WILL SMITH

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Find out more about all the apps, utilities, and extras bundled with this magazine.

12 Ask the Doctor
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A comprehensive list of all the silicon that matters.

24 Tweak Your Bios
You're not a true PC geek until you've changed the settings in your BIOS.

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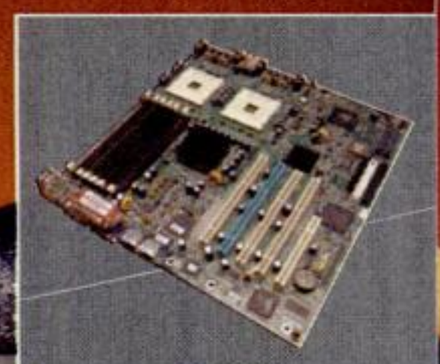

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HARDWARE

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Do you know the *actual* maximum speed of your CPU? Not if you haven't tried overclocking.

34 The Best Cooling Device
If you want to fill your PC with the hottest components, you better learn a thing or two about cooling your case's innards.

40 Case Airflow
Learn how to organize your componentry for optimal airflow.

44 Paint Your Case
Follow along as the experts at Falcon Northwest paint and decal the Maximum PC 2002 Dream Machine.

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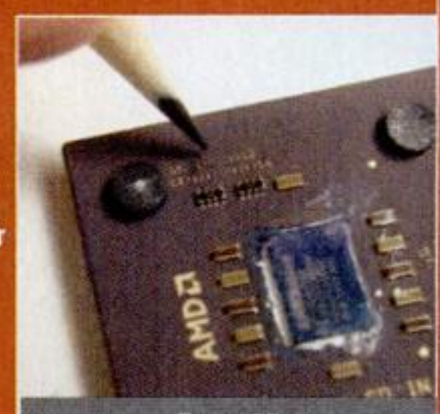

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SOFTWARE

Even the best operating system can benefit from a little tinkering here and there...

Former *Maximum PC* editor turned big-time filmmaker Rick Popko shows you how he made a feature-length movie using DV.

Six simple steps to a more secure PC.

Learn the basics of game modding with this step-by-step instructional on making an in-game model.

From choosing the right camera, to taking the perfect pix, to editing your photos with software, this how-to has it all.

Ever think of turning an old computer into an Internet router? We'll show you how.

There's no need to settle for less-than-perfect MP3s—not once you've learned what we have to teach you.

Some tips and tricks for holding your own in a deathmatch.

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ON THE DISC

33 apps, utilities, games, and extras on our CD-ROM...

APPLICATIONS

3DMark2001 SE: Once you've followed our Overclocking Guide on page 30, or installed some of the cooling devices reviewed on page 34, run this benchmark. It's the single-best tool for determining how your PC performs with new cooling.

ACDSee: One of the best image-viewing programs for Windows. It supports every image format under the sun and is the perfect tool for loading images quickly. Check out more in our digital photography how-to on page 72.

Adobe Elements: Basically *Photoshop* without all the hardcore features for four-color professionals, this image-editing app received *Maximum PC's* coveted Kick Ass Award. Find out more on page 72.

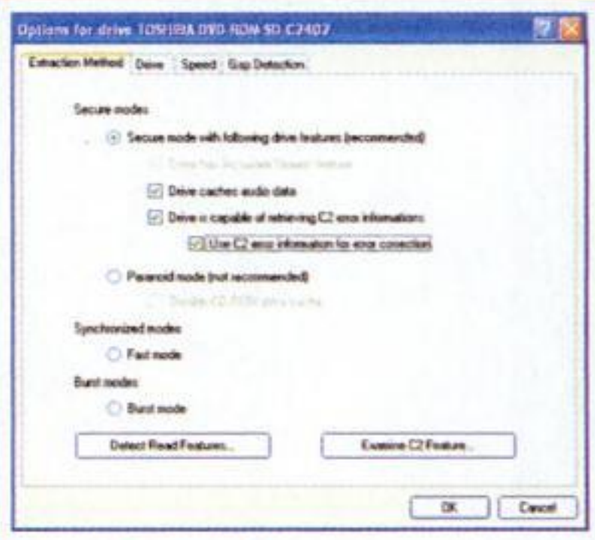
Adobe Premiere 6.0: Former *Maximum PC* editor Rick Popko created a feature-length movie using a DV camera and *Adobe Premiere 6.0*. All his secrets are on page 56.

Album Express 3.0: Wraps all your pics into a simple, searchable interface. Check out more on page 72.

CompuPic: Lets you crop, color-adjust, and even rotate and resize your images within a convenient browser interface. Check out more on page 72.

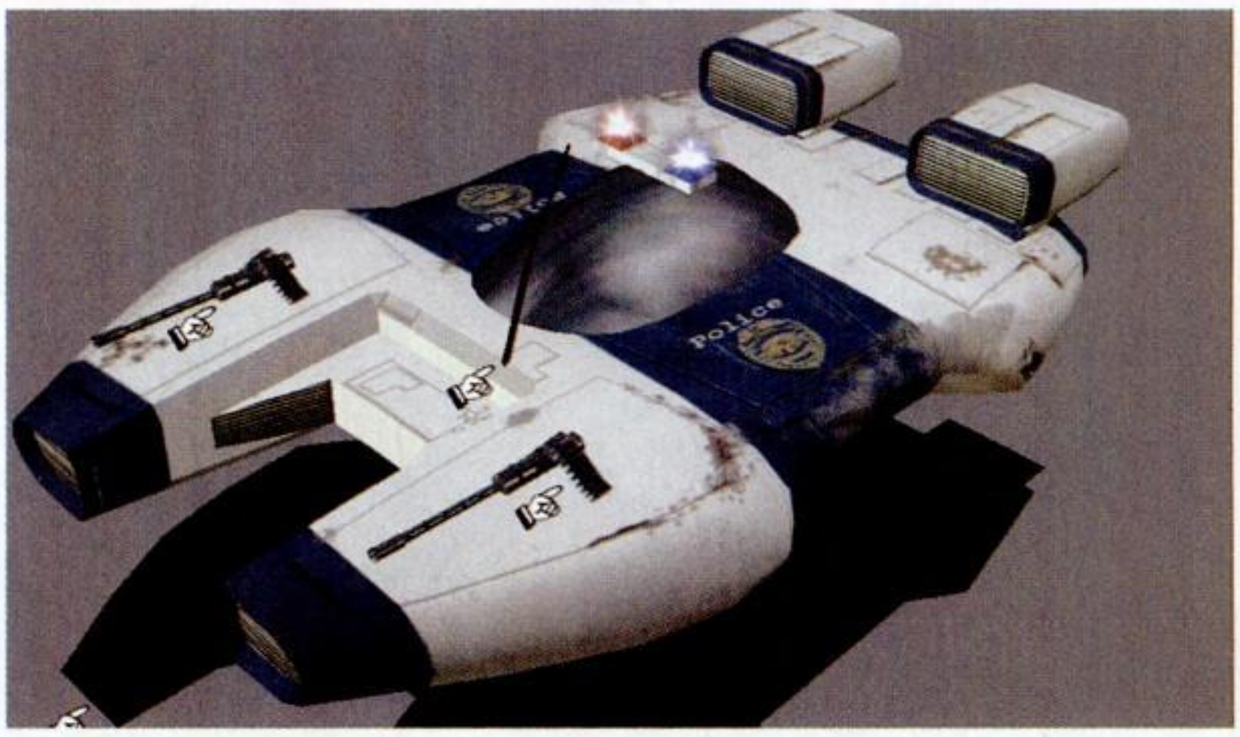
Final Draft: As one of the best screenplay-formatting apps around, *Final Draft* will help you get your script into your PC in record time. On page 56, Rick Popko, a former *Maximum PC* editor, describes the entire creative process.

LAME: If you absolutely, positively have to encode reference-quality MP3s, install *LAME* on your system and turn to page 82 for the full scoop on using it.



Exact Audio Copy: If you think *MusicMatch* or *Windows Media Player* is the perfect app for digital audio extraction, think again. On page 82, we show you how to use *Exact Audio Copy* like a pro.

Macromedia Fireworks MX: For hardcore web developers, there's no better application than *Fireworks*, which was expressly designed to create images for the web. See page 72.



gmax: As the baby brother of *3ds max*, this free, full-version app is perfect for anyone who wants to give 3D modeling a whirl. We used *gmax* to create the futuristic police cruiser you see pictured here. See page 64 for details.

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Paint Shop Pro: If you need to edit photos or create textures for 3D models, but don't want to fool with a scary app like *Photoshop*, take a look at *Paint Shop Pro*.You can even use it to create textures for the 3D model featured on page 64.

PictureBook: Helps you manage the thousands of digital images stored on your hard drive. Stores descriptions of your shots, and lets you search your library by keyword. Check out more on page 72.

PowerDVD: Want to take a screenshot from your favorite DVD to use as your PC's wallpaper? The Doctor tells you how to use *PowerDVD* for just such a task. See page 12.

RazorLAME: *RazorLAME* takes the pain out of *LAME's* confusing command line interface by putting all those awful switches into a convenient GUI. Turn to page 82 to learn how to use *RazorLAME* to make a perfect MP3.

Smart Pix Manager: If you're looking for a more advanced solution than *Album Express*, give *Smart Pix Manager* a try. Its relational database lets you store, sort, and assign keywords to all your photos. Check out more on page 72.

Ulead PhotoImpact 7.0: Another inexpensive image editor that could help you tame your digital photos. Check out more on page 72.

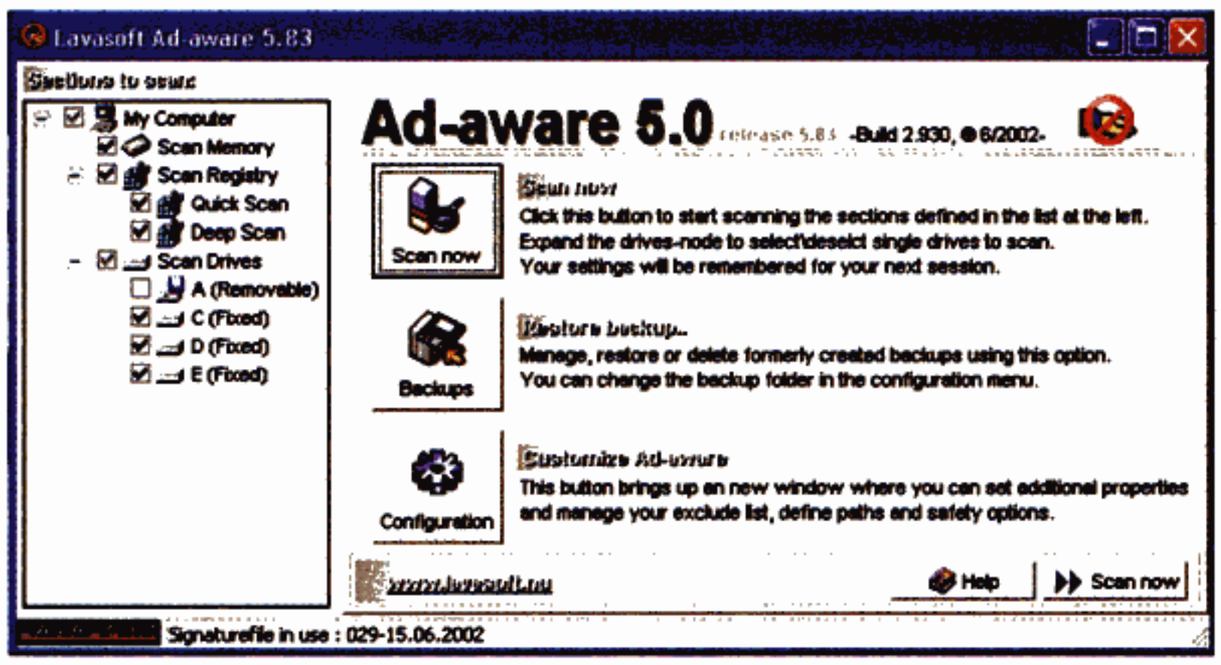
ZoneAlarm Plus: No PC is safe without a firewall, and *ZoneAlarm* is one of our favorites. We show you how to install and configure it on page 78.

UTILITIES

Advanced Administration Tools: Use *AATools* to detect intrusion and troubleshoot problems with your LAN. Don't know how it works? Turn to page 60 for the inside skinny.

Bootvis: Windows XP is the fastest-booting version of Windows ever, but you can save even a few more seconds by running *Bootvis*. Find out how in our XPTweaks section on page 52.

CPU Burn-in: Use *CPU Burn-in* to ensure that your overclocking job will stand the test of time. If you aren't quite sure how to overclock your PC, turn to page 20 for the full scoop.


Lavasoft Ad-aware 5.83
My Computer
Scan Memory
Scan Registry
Quick Scan
Deep Scan
Scan Drives
A (Removable)
C (Fixed)
D (Fixed)
E (Fixed)
Ad-aware 5.0
-Build 2.930, 6/2002-
Scan now
Click this button to start scanning the sections defined in the list at the left.
Expand the drives-node to select/deselect single drives to scan.
Your settings will be remembered for your next session.
Backups
Configuration
This button brings up an new window where you can set additional properties
and manage your exclude list, define paths and safety options.
Help
Scan now
Signaturefile in use : 029-15.06.2002

Ad-aware 5.83: Afraid spyware's out to get you? It probably is. Read our PC security how-to on page 60, then install *Ad-aware* to confirm your worst fears.

Motherboard Monitor: If you've overclocked your system so much that it's on fire, install *Motherboard Monitor* to see how hot it really is. There's a whole lot more info on page 30.

Norton AntiVirus 2002: Protect your PC from Trojans, worms, password stealers, and, yes, viruses. Test it out while you secure your PC. See page 60.

Panda AntiVirus: Panda's antivirus technology is a good first line of defense against infection. Instead of digging around at the hard disk level, Panda watches Winsock—your computer's connection to the net—to protect you. Look to page 60 for more info on securing your PC.

Pop-Up Stopper: Not only are pop-up ads annoying, they can also install spyware on your PC. Read all about PC Security on page 60, then install *Pop-Up Stopper* to de-pop your PC.

EXTRAS

Three Bonus Articles: We've included three reader-favorite How-To stories exactly as they appeared in *Maximum PC* magazine: Learn to build your own PC, create a set of custom rescue disks for Windows XP, and paint your own PC's case.

Exclusive! The Monsturd Trailer: Created entirely on the PC for less than the price of a pickup truck, *Monsturd* (featured on page 56) is quite a piece of work. Here's the theatrical trailer, shot on a DV cam, and edited with Adobe *Premiere*.

Unreal Tournament 2003: Frag your way to greatness with the latest version of *Unreal Tournament*. Fire it up for some deathmatch action after you've worn yourself out working on your PC all day.

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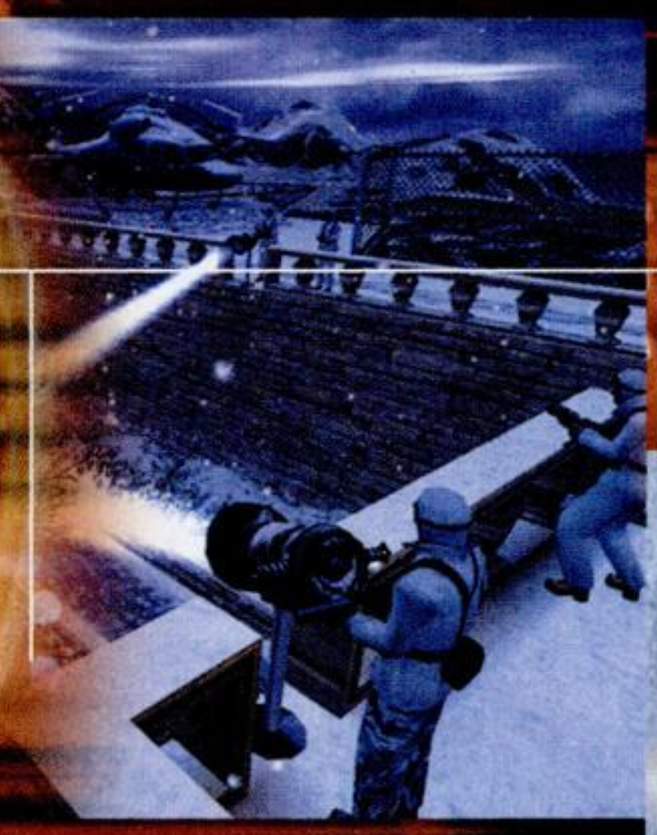
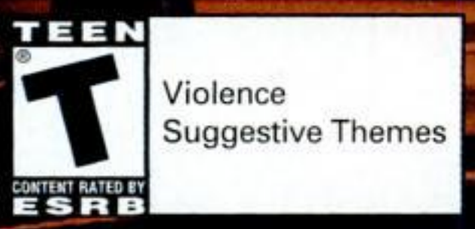
YOU HAVE 60 SECONDS TO SAVE THE WORLD. GO.



You'll need gadgets, lots of gadgets, gadgets to master the art of becoming invisible, infrared goggles to start, maybe a grappling hook



Violence
Suggestive Themes

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tick a laser camera, tock and magnets tick all to help you obtain secret documents tock and then scale the walls of a large international organization 60 stories above Tokyo,

tick or defend yourself from sniper fire high above the alps tock while dodging bullets from tick would be jungle assassins all in time to tock get the girl

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REFERENCE

Our *Ultimate PC How-To Guide* begins with a resource that's been requested time and time again: A compendium of our technical experts' most valuable **troubleshooting advice**. If your PC has a problem, chances are you'll find answers here. Next up is all the spec info you'll ever need on modern **CPUs**, **chipsets**, and **BIOSes**. Let the PC upgrading, tweaking, and benchmarking begin!

Ask the Doctor

Q & A with our PC technical authority

[HOME NETWORKING]

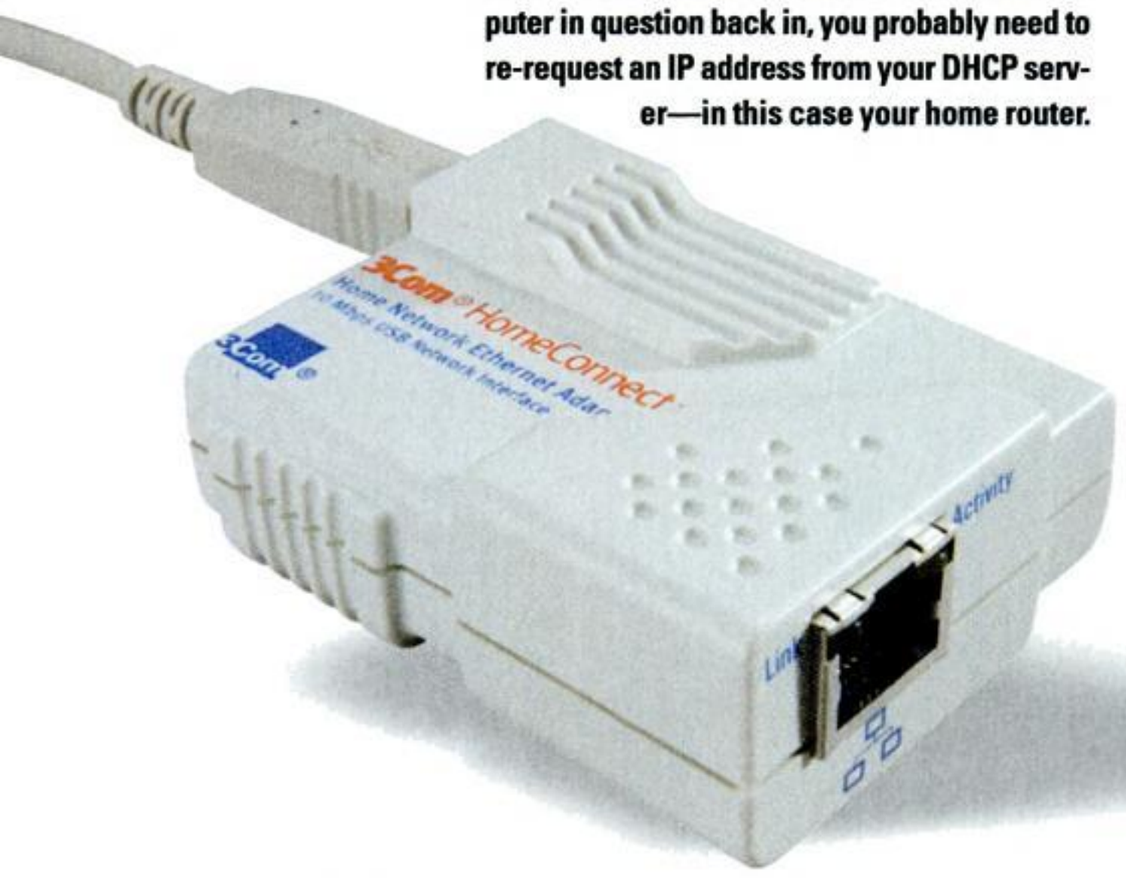
It Ain't All Wizards

Using a home router and some Ethernet adapters, I've rigged my PCs into a home network so they can share my broadband Internet connection. Right after I load Windows 98SE, and all the devices are configured with the proper network settings, the "Network Neighborhood" lists all the PCs in my house. File sharing, Internet access, and everything works great until I disconnect the network cable for use with another PC for a few days.

When I reconnect, all the PCs in my house are gone from the Network Neighborhood, except the computer I'm on, and I have no access to the Internet. The network configuration settings weren't changed and devices are all "working properly." I've tried everything I know to get it working, but nothing does it reliably. Usually after two or three days of futzing around, it might work. Can you tell me what's going on and how to remedy this in the future?

—KERRY SULLIVAN

It sounds like you're having a problem with your TCP/IP address. When you plug the computer in question back in, you probably need to re-request an IP address from your DHCP server—in this case your home router.



An Ethernet adapter is a handy item to have around to test potentially bad network cards.

You see, Windows' file and printer sharing usually uses TCP/IP as the protocol for talking to other machines in your local workgroup. The Internet always uses TCP/IP. If you were able to access the Internet, but not other machines in your workgroup, it would indicate that TCP/IP was working fine. (In which case, you're either not logging into the network, or all of your PCs aren't part of the same workgroup.)

Because your problem *is* most likely TCP/IP related, go to Start, then Run, and type winipcfg. This applet allows you to request a new IP address from your router by pressing Renew All.

If that doesn't work, it's possible the culprit is a bum network card. The Doctor recommends that you test your PC with a USB Ethernet adapter, and see if that eliminates the problem. Otherwise, you need to find someone in your area who knows about networking and makes house calls.

[FLOPPY DRIVE]

Floppy Be Gone

I just recently built my newest system and decided I didn't need a floppy drive. So I assembled the machine, went into the BIOS, disabled everything that even mentions floppy, loaded Win98SE, and bang...it works...*not*! If I go to My Computer it shows a "Removable Drive A," and if I go to the Performance tab on the System Properties window it shows the message: "Drive A is using MS-DOS compatibility mode (yadda yadda)...." Can you please tell me what on earth I have to do to convince Win98 that there is no floppy drive?

—SHANE WEAVER

After conducting exhaustive digging through our archives and harassing sources around the web, the only thing we know to do is upgrade your OS to Windows 2000 or Windows XP. (The Microsoft Knowledge Base article about this very issue says, "To work around this problem, you can safely ignore it.")

We've tested floppiless configs with both Windows 2000 and Windows XP and not had any of the weird problems that you describe with your Windows 98 config.

[DRIVE IMAGING]

Stupid Disk Image Tricks

I just put together a new system with a Tyan 2390B motherboard, an 850MHz Athlon, 256MB of Micron SDRAM, an ATI Radeon 64 SDRAM videocard, and a 20GB Maxtor hard drive containing a cloned image of my previous Win98SE OS. Every time I start it, the system locks up. I have disabled all of my power-saving options and screensavers as well as disabled all my startup items in msconfig. If I start the machine in safe mode, it won't freeze on me, but it does freeze in regular mode. What am I doing wrong? Help me!

—JASON BOWMAN

While imaging your drive is great for backing up data and easing the pain of system reinstallation, it can't work miracles—and you're asking it to work miracles. Because your drive image contains all the drivers and Registry information of the PC it was created on, when you dump that image into a new PC, your box will become confused. The software in your OS won't recognize the hardware in your case. In fact, it will think every single piece of hardware has been changed in between reboots. Hence your lock-ups.

You can attempt to repair the mess by downloading current drivers for all your hardware (including the network card or modem, motherboard chipset, and graphics card), then deleting the HKEY_LOCAL_MACHINE/ENUM folder (and all folders underneath it) from your Registry. After you reboot, reinstall the drivers for all your hardware. Everything should work better afterwards. Or maybe not—so don't come griping to us if this operation totally borks your system. Your best bet is to clone the image of your old drive to a spare hard drive, then do a clean install of Windows 98 on the new PC, then grab whatever files you need from the original drive image.

[BUILDING IT]

What Order Art Thou?

I'm in the process of building my first system and was hoping for some assistance. I have an Asus A7V motherboard and an Athlon 1GHz chip. My question involves two of the components I would like to use. The first is an Elsa Gladiac 920 videocard, and the other is a Sound Blaster Live! 5.1 soundcard. I've read about conflicts involving these two boards and the VIA chipset on the motherboard. I also want to know the best order for installing my new drivers. Any help you can provide would be greatly appreciated!

—LOONEY

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We've not heard of any problems between the A7V and either of those two cards that can't been fixed with driver updates, so you should be safe there.

As a general rule, as soon as the OS is installed in a system we're building, we load the latest chipset drivers from our motherboard manufacturer. Next we install the latest version of DirectX, followed by our videocard drivers. From that point on, it doesn't really matter what's installed next. Load your sound drivers, network drivers, and drivers for any other hardware you installed.

[MP3]

Music Mayhem

I've been having trouble playing my MP3s. The first time I play an MP3 file, there is some kind of interruption at the beginning of the song, then it continues to play. I have to push stop and play the song again for the MP3 to play without a problem. I have the latest versions of *MusicMatch Jukebox* and *Windows Media Player*, and this problem happens with both. I have played many different MP3s and even re-downloaded some songs, but it still happens. I updated sound drivers, defragged, and scanned my drive for errors, all to no avail. I experience the problem using both my HP Pavilion laptop with a 550MHz Celeron and my Compaq Presario laptop with a 533MHz AMD K6 and 96MB of RAM. So do you think you can help me?

—O.A. ASSAD

You've done some pretty good triage already. You tried downloading new MP3s and had the same problem—check. You tried different media players, but that didn't help either—check. You even tried a different laptop with the same result. Well, *there's* your biggest clue.

The real problem here—and you might want to sit down for this—appears to be that both of your laptops are just too slow. In fact, some of the specs you listed are the *minimum* requirements for running both of the media players you mentioned, and we all know that minimum requirements do not yield the best results. And remember, MP3s aren't played "as is"—they have to be decompressed just like a zip file. Most rigs today don't have any problem doing this on the fly, but an older processor running a new, resource-hogging media player while simultaneously running antivirus and indexing software in the background... well, you get the idea.

Just to make sure, try playing one of your MP3s on a friend's faster desktop system. We bet you'll find that it plays without a hitch.

All is not lost, though. You might still be able to coax one or both of your laptops to play MP3s without hiccups. First, try to find the lightest, simplest software MP3 player. With less than a 10MB memory footprint, Sonique (www.sonique.com) is a likely prospect. Next, have a look at your System Tray. Are there apps you can temporarily disable, like antivirus software or IM clients? Disable them. You might even want to stop apps like these from loading automatically at startup: Go to Start > Run > and type msconfig. Click on the Startup tab. Uncheck anything you don't want to automatically launch (they can always be re-checked later).

Keep trimming the fat off your OS in this manner until your MP3s play without skips. Or just go back to vinyl.

[SPEAKERS]

Speaking Out

I am the proud owner of a set of 4.1 Klipsch Promedia speakers, but there is one thing that frustrates me. After searching through the company's web site, I found nothing that would lead me to believe an upgrade is available for the 5.1 setup (center channel and control tower). I forked over $250 for the very best in computer audio; but for me to get 5.1 sound, I have to fork over another $400 for a whole new system. Am I to believe that Klipsch cannot offer a center channel and control tower to 4.1 series owners at less than the cost of a 5.1 set? I'm sure that there are many other 4.1 owners who feel the same frustration as I.

—GREG ROEBKE

As a matter of fact, Greg, the Klipsch 5.1s do include a significantly upgraded subwoofer. The new sub offers a six-channel BASH amp and two 8-inch woofers. The original 4.1 sub offers two 6.5-inch woofers and has just a five-channel amp. Unfortunately, while it was possible to upgrade version 1 Promedia 4.1s to version 2 fairly easily, there are too many components that need replacing to easily and inexpensively upgrade from the 4.1 to the 5.1 system.

[EXTERNAL CONNECTORS]

FireWire vs. USB 2.0, Round 14

I just heard about this new USB 2.0 thing and wondered if I should upgrade my FireWire external hard drive to USB 2.0? Right now, I'm using the drive mainly for video editing. If you don't think I should use USB 2.0 for my hard drive, what do you think it's good for? How fast is it compared to FireWire, and what are its limitations?

—MARTY ATKINS

The Doctor doesn't see much reason for you to upgrade your FireWire hard drive to USB 2.0, especially if you're using it for digital video.

The Doctor is pretty fond of USB 2.0, but in this case, he thinks you might want to stick with FireWire. USB 2.0 is an alternative to FireWire,

"Am I to believe that Klipsch cannot offer a center channel and control tower to 4.1 series owners at less than the cost of a 5.1 set?"

but not necessarily a replacement. Here's how they stack up: FireWire has a maximum bandwidth of 400Mbps, which translates to 50MB per second. USB 2.0 has a *maximum* bandwidth of 480Mbps, which is equivalent to 60MB a second. But these are maximum bandwidths, which you will probably never see achieved by your peripherals. So it's unlikely you'll see much of an improvement in speed using a USB 2.0 device instead of a FireWire one.

But given that you use the drive mainly for video editing, there are two more big fat reasons for sticking with FireWire. One, FireWire is the standard connection for digital video cameras, and some pro-level DV editing solutions (such as AVID) actually qualify specific FireWire hard drives. And, as if that weren't enough, FireWire peripherals are capable of peer-to-peer transfers, meaning that, for example, you can edit footage with two digital video camcorders connected via FireWire without having to connect them both to a PC first.

Still, don't turn up your nose at USB 2.0. It's ever-so-slightly faster than FireWire, is per-

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fectly competent for most peripheral tasks, and has a feature FireWire can't boast: backward compatibility with USB 1.1, the connection you'll find just about anywhere you go

[DVD]

Capturing Stills

I'd like to pull some images from a DVD running on my PC to use on a few of the pages of my personal web site. When I pause the movie, press the Print Screen button on my keyboard, minimize the DVD player, open up a program like *Photoshop*, and select Paste, all I get is a green box! Why does this happen? Is there any software available that will allow me to grab images from a DVD?

—JASON MIDDAUGH

This happens because the Print Screen button captures the windowed image from your video RAM, which, as you have observed, doesn't contain any of the information coming from your DVD decoder. If your DVD decoder sent its signal through the video subsystem en route to your monitor, the full-motion video stream would hog all the bandwidth, leaving little room for anything else. So most hardware and software DVD decoders use a much more efficient method called video overlay that sends the video stream directly into the VGA signal, bypassing your videocard altogether. That's why you can have your color mode set to 256 colors yet still get true-color images from your DVD player window. This sly maneuver is accomplished using a technique called colorkey, which selectively replaces a specified pixel color (usually magenta or near-black, but in your case, green) with video content after it has passed through video RAM. So your software player fills its window with green pixels, which are then replaced with video from your decoder.

True X—for those who missed it—achieved hurricane-like speeds by splitting the laser into seven discrete beams for simultaneous reading.

In order to capture the video from your DVD, you need to disable hardware acceleration in the DVD player application you use (if the option is available), which will force the decoders to write to standard video memory. *PowerDVD* offers this option, which is very handy for taking a few shots while you watch your movie.

[DSL]

Not Digging the Disconnect

Ever since we got DSL installed, we've had a strange problem. It intermittently cuts out for varying lengths of time. This ranges from a few seconds to a couple of minutes. Several times I've had to disconnect and reconnect to get it to work again. What's the problem here? Is it my connection or my service (which is through our local phone company)? Is there any way to fix this, short of getting a cable modem?

—MICHAEL MILLER

The problem could be due to any number of things: service interruptions on the provider level, line noise in your local wiring, a bad jack, or even a phone that shorts out occasionally. But nine out of 10 times, the problem you're describing is the result of a telephone using the same line as the DSL modem.

This is called a "shared-line install" in DSL industry lingo, and if it doesn't work according to plan, your DSL might conk out when you're on the phone or whenever the phone rings. To fix the situation, get a $3 DSL line filter from Radio Shack for each line in the house that runs between a wall jack and a phone (make sure you don't touch the line between the wall jack and the DSL modem). This filter keeps phone users from hearing DSL noise and vice versa.

If that doesn't fix your problem, you're going to need to call your friendly, neighborhood telephone company and complain. They'll send out a technician with an expensive line tester that will diagnose your problem more accurately than you can.

[CD BURNING]

OK, You're 'Old School'

Call me old school or something, but I prefer the two CD-ROM/CD-RW drive setup. I'll have none of this "one drive does it all" mumbo jumbo. My problem is that my CD-ROM vendor no longer supports or offers firmware updates for my Kenwood 72x. It's still the fastest CD-ROM drive that I've ever used or seen, but now it sometimes can't even recognize certain new game discs (such as *Jedi Knight 2*).

What CD-ROM drive do you suggest I pair with my Plextor 16/12/40A? Sure, I can just go out and get a generic 52x CD-ROM drive for $20, but that's not my style. I want the best ATAPI CD-ROM drive I can get that's still supported by the manufacturer on newer OS platforms.

—JOE "CYPRINIOUS" CARPIO

There are still a lot of fans like yourself extolling the virtues of the True X technology used in Kenwood's 72x CD-ROM drives. Those fans are generally the people for whom the notoriously unreliable drives initially worked. True X—for those who missed it—achieved hurricane-like speeds by splitting the laser into seven discrete beams for simultaneous reading.

But now that CD-RW drives are routinely able to read at 40x and above without any shaky beam-splitting technology, Kenwood, and just about every other manufacturer, is distancing itself from this technology and the drives that use it.

If buying a cheapo CD-ROM drive isn't your style, why bother with another CD-ROM drive at all? Other than the budget drives you see stacked at CompUSA, these drives are a dying breed.

You made no mention of having a DVD-ROM drive, so that's the Doctor's first upgrade recommendation. Pioneer's DVD-500M is replacing our current favorite, the DVD-116. The 500M offers up to 40x read speeds—just as fast as the Plexy you've got.

Or you might consider upgrading your burner and using the Plextor as your reader. The newest drives, like TDK's VeloCD 40x, now sport read and DAE (digital audio extraction) speeds of 48x!

Finally, how about a DVD burner, such as Pioneer's DVR-A04? Now that would really be showing some style.

Placing one of these thingies between your phone and the wall jack can save you the pain of DSL disconnections.

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[VIDEOCARD]

Doing Right by My PC

I know a lot of people ask which videocard they should buy. My dilemma relates to which card, given my particular computer processor and speed.

I have a custom made P-III 933MHz, 384MB PC100 SDRAM, ASUS CUV4X motherboard, and a 32MB GeForce2 GTS card. I'm ready and willing to spring for a GeForce3 Ti card or maybe a GeForce4, but wonder if my processor and RAM could effectively use the extra videocard boost. Would I be better off plunking down the bucks for a Pentium 4 1.8GHz machine instead?

—ROBB SEYLER

You pose an interesting question. Whether a videocard upgrade or a CPU upgrade will help more depends on the types of games you play. If you're playing intense 3D accelerated games, such as first-person shooters, then a videocard upgrade could help you more than a CPU upgrade. On the other hand, if you're playing non-3D accelerated games, like many realtime strategy games and some RPGs, a CPU upgrade will provide greater benefits.

The other thing to consider is price. Upgrading your CPU isn't as simple as buying a Pentium 4 and plugging it into your current motherboard. You'll need to purchase a new motherboard for around $100, probably new RAM (another $100 or more, depending on the amount you buy) and a new power supply ($50 or so). Upgrading the videocard is as simple as pulling the old one out, and putting the new one in.

[MONITOR]

LCD Letdown

I have a Dell P-III 866 with an nVidia TNT2 M64 videocard. I was playing *Unreal Tournament* on a Dell M781 17-inch CRT. The graphics and performance were fine (at least for me) until I switched to an NEC Multisync 1830 LCD monitor. On the new monitor, game performance sucks! It's choppy and rough. What can I do to improve the game on my LCD? Or should I buy another graphics card and run two monitors—CRT for games and LCD for everything else?

—JEFF PETTER

Well, Jeff, you're not the first person who's been bitten on the ass by the limitations of LCD panels. Although the Multisync 1830 is among our favorite flat panels, it still has the same basic problem as any other flat panel. It supports only one resolution, which is called the display's "native mode." For the Multisync 1830, that resolution is 1280x1024, and it's at this resolution that games will look their best. Unfortunately, your videocard isn't powerful enough to give you decent frame rates at the native resolution. You can either play your games at a lower resolution and let the display's internal hardware interpolate up to the native resolution, or crank up the resolution and suffer through choppy frame rates.

The downside to interpolating a lower resolution up to your LCD panel's native resolution is that your game may look less sharp. What's the alternative? Grab a card that's able to produce 3D at your display's native resolution. Most GeForce3 boards are more than capable of running at 1280x1024.

[DATA RETRIEVAL]

Hard Times for the Hard Drive

Any ideas on how to get some data from a dead hard drive?

—ROBERT BANNER

As a general rule, from an end-user standpoint, once it's dead, it's dead. Sure, in certain circumstances, you can use software, such as PowerQuest's *Lost and Found*, to recover a couple of files—if you're lucky.

If you've lost data that you really, really have to get back, consider a professional data-recovery operation. DriveSavers Data Recovery (www.drivesavers.com) will attempt to retrieve your data from a dead disk. The average price is around $700, so this isn't for the light of pocket. For kicks, we got an estimate for a dead 20GB Western Digital drive we had floating around the Lab. For a five-to-seven day turnaround on the drive, DriveSavers gave us an estimate of between $575 and $1,900. Naturally, if the data you want isn't recovered, you owe nothing.

[SYMMETRIC MULTIPROCESSING]

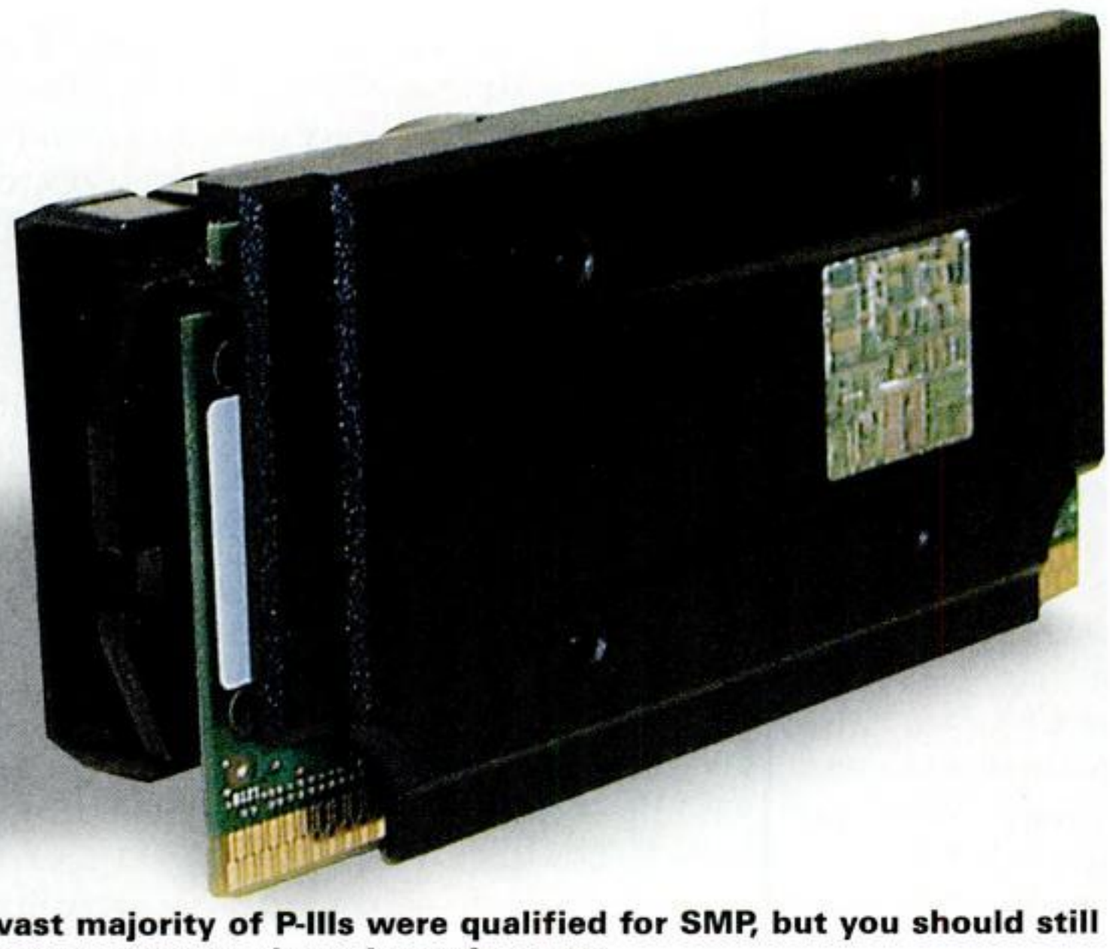
Does Pentium III Do SMP?

I have a dual Slot 1 Tyan Tiger 133MB with two P-III 733MHz CPUs, 512MB RAM, and a Voodoo5 videocard. I recently came across an article online that identified certain Pentium IIIs as being incompatible with an SMP environment. Unfortunately, my P-III 733MHz processors happen to be "non-SMP functional." I have noticed that *Photoshop* never uses my second processor, although it's installed in the Windows 2000 hardware. So is my second processor being utilized at all?

—D. MONTEIRO

Upgrading your CPU isn't as simple as buying a Pentium 4 and plugging it into your current motherboard.

You may have misinterpreted the article you read on the web. Both Intel and AMD go through great lengths to qualify CPUs for SMP use. When Intel says the CPUs are "not compatible," that means Intel does not *guarantee* it will work. This could mean the CPU did not pass 100 percent of the SMP tests Intel conducted on the CPU, or it could mean Intel did not test it for SMP. Either way, just because the CPU is not listed by Intel as SMP compliant, it doesn't mean it won't work. Hobbyists have been running dual Celeron machines for quite some time even though Intel neither certified nor intended that CPU to be used in dual



The vast majority of P-IIIs were qualified for SMP, but you should still make sure your specimen is ready to go.

boards. I wouldn't use *Photoshop* as a good gauge of multithreading. Depending on the version you have, only a few of the filters and functions in the program use both processors. If Windows 2000 shows two CPUs and you can see both functioning in the Task Manager under the Performance tab (assuming that you haven't set the graph to combine both CPUs), your proc is probably functioning fine. The unfortunate truth is that too few of today's popular Windows applications are multithreaded. Though that may change as Windows XP becomes the desktop OS of the future.

Among the AMD chipsets, the nForce's 128-bit memory interface is a little finicky about the memory you can feed it.

[POWER]

Athlon Instability Revisited Again... and Again... and Again

I have this problem with my GeForce2 GTS 64MB videocard; it occurs most frequently when playing games, but also happens when browsing the web! Problem: My computer simply freezes; if there's music playing, it will play the last note over and over again. After a few seconds, maybe 30 at the most, my computer will reboot automatically. I'm using the latest nVidia drivers and have had Windows XP fully updated from Windows Update. I've tried using a different card—the GeForce2 MX 200 64MB—and the problem decreased, but it still happens. Here's what I have:

‰ O/S: Windows XP Pro

- CPU: 1.2GHz AMD Athlon
- MB: Asus A7M 266 (most current bios)
- VIDEO: GeForce2 GTS and/or MX 64 MB
- RAM: 256 DDR
- Plenty of coolers!

So, please, I really need some help on correcting this issue.

—MICHAEL LINNEMAN

When you have an Athlon-based system that's unstable, your problem is usually one of two things: a wimpy power supply or outdated 4-in-1 motherboard drivers. Of course, it could also be one of the other problems that can affect any PC, such as dirty power from the socket or a cooling problem.

We recommend a 300W or greater power supply for anyone with a 1GHz or faster processor, a GeForce or GeForce2 videocard, and more than one hard drive or lots of RAM. Also, you need to get the latest 4-in-1 drivers for your motherboard from the manufacturer's web site—in this case, www.asus.com. Do not confuse this with the BIOS, which is a totally different beast. While we recommend keeping your BIOS up to date, it's not as vitally important as having current 4-in-1 drivers, which control things like your PC's AGP port, IDE controller, and power management.

If new 4-in-1 drivers and a better power supply don't help, dirty power might be your problem. Frequent brownouts, line sags, or spikes can cause your PC to lock up. An inexpensive battery backup may be the solution. Battery backups even out sags and spikes, which should help prevent the electric companies' problems from crashing your rig.

Finding where *Outlook* stores your mail and contacts is as easy as clicking on Properties for Outlook Today.

[MOTHERBOARDS]

Call My PC "Sir-Crash-a-Lot"

I am having serious problems with a rig I just built. It's an Athlon CPU on an Abit nForce motherboard with a Radeon 8500. I have plenty of cooling and heat dissipation. My problem is that the damn thing crashes when I run any 3D intense applications (such as *3DMark2001* or a 3D game). When not running 3D apps, it also arbitrarily crashes. I have installed all the latest drivers (videocard, mobo BIOS, mobo chipset, soundcard, Windows updates, etc.), and none have helped. I have tried disabling or disconnecting everything inside the computer with the exception of the videocard and hard drives. The crashes still persisted. I placed the videocard in a different computer and it ran fine. I put a Geforce2 Ultra in my newly built rig and it crashed. I tried underclocking the CPU with no luck. I receive different error messages ranging from stop errors to page fault errors to IRQ_NOT_LESS_THAN errors to Radeon driver errors to USB port errors, and so on. I sent numerous error reports to Windows Online Crash Analysis. They suggest things that I have already tried or say they will get back to me via e-mail. I have not heard anything from them yet.

I believe the problem lies with the motherboard, but I do not know how to verify this. Any suggestions you may have would be greatly appreciated.

—DARREN WILLIAMS

It sounds like you've done your due diligence in trying to isolate most of the other components. If you're overclocking or you have aggressive memory settings in the BIOS, revert to the default settings. You should also try isolating the RAM, CPU, and power supply from the equation. It's possible that one of the memory modules is defective or the nForce-based motherboard doesn't like the configuration of the memory you've chosen. Among the AMD chipsets, the nForce's 128-bit memory interface is a little finicky about the memory you can feed it. You may want to run the board in 64-bit mode with just one module at a time to see if the crashing goes away.

If it's not the memory, then you also have to consider the slim possibility that the CPU is the culprit. Although extremely rare, it's possible the CPU is defective. If you can borrow a CPU from a friend, try swapping out your CPU for a CPU that you know works. Also borrow a friend's power supply. If it still crashes with the second power supply, then the board is likely at fault. The Doctor's first suspicion is flaky memory, but it's possible the other components are to blame as well.

Before you start your testing, wipe the system clean to make sure it isn't a bad device driver left over from other hardware, and remove all other PCI, USB, and extraneous devices. When swapping out components, swap them one at a time. Good luck.

[MEMORY]

Hourglass Morass

My 733MHz Celeron system with 192MB of RAM has a problem. When I right click the desktop display to check Display Properties, it hangs and shows me only the hourglass instead of the display menu. If I right click the desktop icons, the context box is there instantly. I was wondering if there could be a problem with the Intel graphics adapter accessing memory, or something to that effect? Please help me keep my PC from mocking me.

—CLINTON HOLLINGSWORTH

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PC slowdowns and hangs can be caused by a lot of different things. First, you should make sure you have the latest drivers for your motherboard chipset loaded from www.intel.com. (For non-Intel chipsets, see your motherboard manufacturer's site.) It's also a good idea to load the Intel Application Accelerator and Intel Graphics Driver. Then definitely defrag your hard drive.

Finally, you might have too many apps open, taking up precious system memory. If you run out of RAM, Windows will be forced to use the swapfile on your hard drive, which slows the whole system to a crawl. To free up memory, close any nonessential Taskbar apps and see if that gets rid of your hourglass woes.

[E-MAIL]

Wherefore Outlook?

I'm using *Outlook XP* to hold my e-mail and contacts. I want to set up *Outlook* so that the contact information and mail is stored on a second partition instead of c:. That way I should be able to keep my contact information safe and secure.

—CHRIS

The best way to back up your *Outlook* contacts is to go into *Outlook*, right-click Outlook Today in the Outlook Shortcuts bar, then click Properties and click the Advanced tab. The filename field gives you a path to the outlook.pst file, which stores all your mail and contacts. If you copy that to your backup drive before you wipe your c: drive, then re-copy it to the appropriate location after you reinstall Windows XP and *Outlook XP*, your mail and contacts should be just as you left them.

[POP-UPS]

The Problem with Pop-Ups

I've been experiencing some problems with pop-ups lately. Something on my computer is causing pop-ups to open when I go to sites such as www.eba.com, www.microsoft.com, and www.amazon.com. The pop-up ads that appear when I go to these relatively popular sites have nothing to do with the sites I'm visiting; they're ads for cell phones, travel plans, etc. The pop-ups always appear in the bottom right-hand corner of my screen.

Did I install some sort of ad pop-up software? Is there a way to get rid of these annoying things? Please help me, Doctor!

—JOE MCCARTHY

Welcome to the new age of Internet advertising, Joe. These strange ads aren't the hellspawn of a malicious piece of software; they're just the latest advertising tactic foisted upon the web-browsing public. Because ad revenue has not been forthcoming from the traditional banner ads, Internet advertisers have resorted to pop-up and, even trickier, pop-under ads to catch the buying public's eye.

Whereas the original pop-up ad grabs attention from your browser window by jumping to the forefront of your desktop, pop-under ads appear behind your browser window, leaving you alone until you close the browser window only to find a slew of ads featuring scantily clad women hawking, say, "baby monitor" cameras.

To get rid of the pop-ups and pop-unders, head to www.panicware.com and download *Pop-Up Stopper*. The free version is more than sufficient for day-to-day pop-up extermination, but a more advanced version that offers a few more features is available for $20.

[WINDOWS XP]

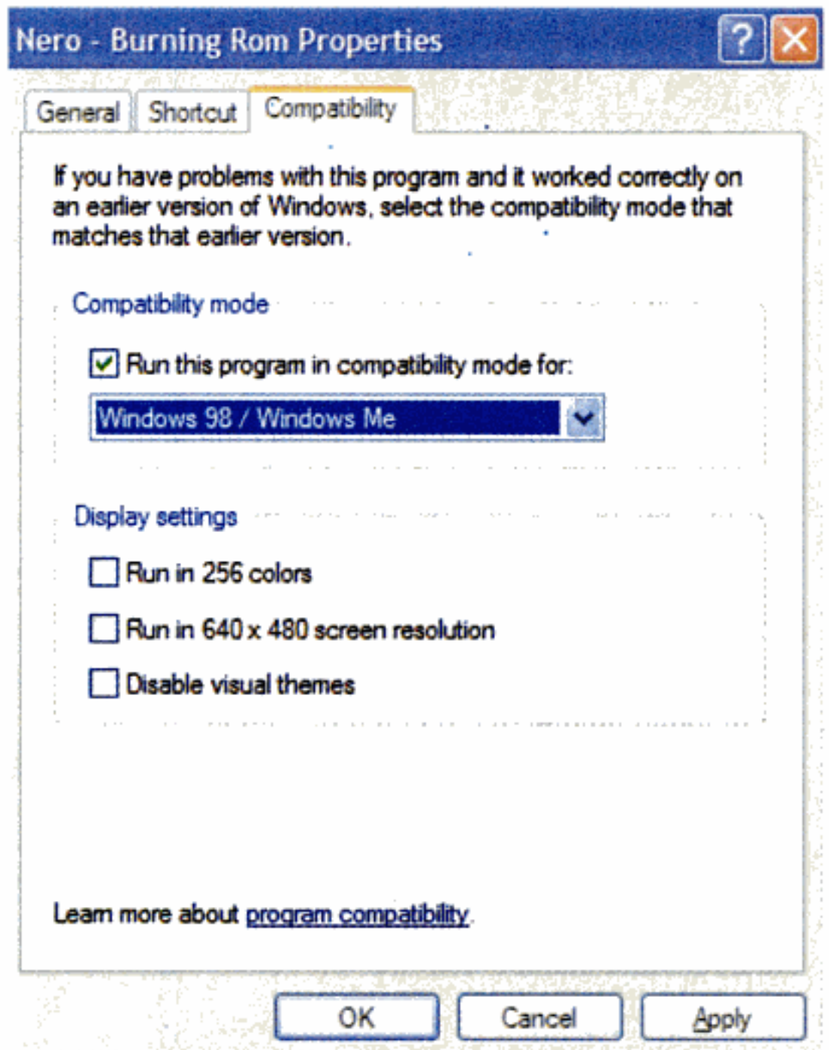
WinXP Doesn't Like My Software

I have upgraded my OS to WinXP Pro. I love it, but I have a few games and other programs—some old and some brand-new—that just won't run with XP. Can you help?

—DANNY

Getting legacy apps to run in XP can be tricky. The best place to start is with the compatibility wizard. Right click the shortcut for your app, go to Properties, then click the Compatibility tab. We've found that most apps run with either Win98 Compatibility mode or Windows 2000 Compatibility mode, especially if you select the "Disable Visual Themes" option.

If you run into an app that won't run in one of WinXP's Compatibility modes, then you might want to try dual-booting your PC with Win98 or another OS that you know works with the app. When installing a dual-boot system, make sure to install the oldest OS first, then the more recent. For example, if you want to install Win98 and WinXP, install 98 first, then once that install is complete, put XP on another partition.


Nero - Burning Rom Properties
General
Shortcut
Compatibility
If you have problems with this program and it worked correctly on an earlier version of Windows, select the compatibility mode that matches that earlier version.
Compatibility mode
Run this program in compatibility mode for:
Windows 98 / Windows Me
Display settings
Run in 256 colors
Run in 640 x 480 screen resolution
Disable visual themes
Learn more about program compatibility.
OK
Cancel
Apply

By using WinXP's built-in Compatibility mode, you can sometimes get recalcitrant applications to run.

Converting your FAT and FAT32 partitions to NTFS is as easy as running a command-line app then rebooting your PC. If you want to convert your c: drive, all you need to do is go to Start, then Run, and type `convert c: /fs:ntfs`. After that, your PC should prompt you to reboot. During the reboot, Windows will convert your drive.

[WINDOWS XP]

Botched Boot Time

Whenever I start my computer, I'm asked to choose which operating system I would like to run. Both choices are Windows XP Pro, but one is from a failed installation that doesn't work. I would like to get rid of the failed installation, or just run the good one by default instead of always having to choose. Please help me!

—BRYAN ANDREWS

[WINDOWS XP]

FAT32 Switcharoo

I recently upgraded from Windows 98 to Windows XP. I remember reading that during the upgrade I would be asked if I wanted to convert from FAT32 to the NTFS file system, and that if I did convert, I would not be able to revert to FAT32. I never received the option of converting, and now it really has me wondering.

Do I still have the option of converting to NTFS somehow, as I hear it is a more efficient file system? And if I do, will it have any negative effects on any of my games or other programs?

—ROBERT TUZZOLINO

Changing your boot options in Windows XP is super easy. You can change the options by editing the boot.ini file on your c: drive, or by going to the System Properties control panel, then the Advanced tab, then the Startup and Recovery button. Your first option will be to change the amount of time that XP displays the startup menu, but we recommend just editing the file. Press the Edit button, then look under the [operating systems] section. The lines that start with multi(0)disk(0)... are the ones that control what shows up in the boot menu, and should be in the same order that they are when you are at the selection screen. Simply delete the one that doesn't work, and you should be good to go. ■

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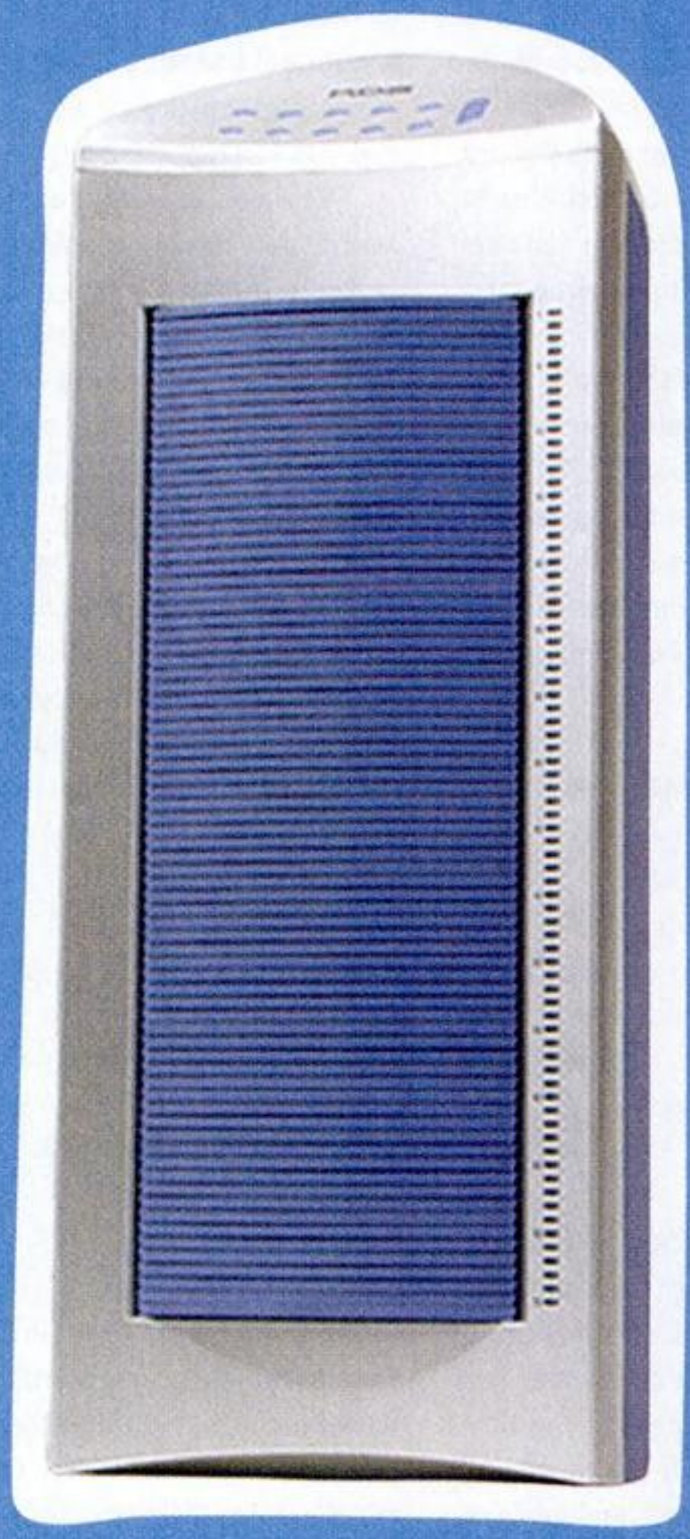
PROBLEM.



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Lab notes: Featuring an improved memory controller, the "A" revision of the KT266 is one of the best Athlon XP chipsets out there.

VIA ProSavage KM266

Memory support: PC100, PC133, DDR200, DDR266; 4GB max
CPU support: Athlon, Duron, Athlon XP
Bus speed: 200MHz, 266MHz
I/O interconnect: V-Link, 266MB/s
MAX ATA support: 100
Lab notes: Sporting integrated S3 ProSavage8 graphics, this variant of the KT266A is targeted at budget systems.

VIA KT333

Memory support: DDR200, DDR266, DDR333; 4GB max
CPU support: Athlon, Duron, Athlon XP
Bus speed: 200MHz, 266MHz
I/O interconnect: V-Link, 266MB/s
MAX ATA support: 133
Lab notes: Builds upon the KT266A by adding support for DDR333 and ATA/133.

VIA KT400

Memory support: DDR200, DDR266, DDR333 (unofficially supports DDR400); 4GB max
CPU support: Athlon, Duron, Athlon XP
Bus speed: 200MHz, 266MHz, 333MHz
I/O interconnect: V-Link, 533MB/s
MAX ATA support: 133
Lab notes: Throws AGP 8x, USB 2.0, a faster interconnect, and 333MHz FSB support into the mix.

AMD 760

Memory support: DDR200, DDR266; 2GB unbuffered/4GB buffered max
CPU support: Athlon, Duron, Athlon XP
Bus speed: 200MHz, 266MHz
I/O interconnect: PCI/133MB/s
MAX ATA support: 100
Lab notes: The first Athlon DDR chipset, the 760 was a heavyweight in its time. Unfortunately, Athlon XP support is iffy on many 760-based mobos.

ALi MAGiK 1

Memory support: PC100, PC133, VC133, DDR200, DDR266; 3GB max
CPU support: Athlon, Duron, Athlon XP
Bus speed: 200MHz, 266MHz
I/O interconnect: PCI, 133MB/s
MAX ATA support: 100
Lab notes: Though comparable to the AMD 760, the MAGiK 1 can't hold a candle to newer VIA offerings.

SiS 733

Memory support: PC100, PC133; 1.5GB max
CPU support: Athlon, Duron
Bus speed: 200MHz, 266MHz
I/O interconnect: MuTIOL, 1.2GB/s
MAX ATA support: 100
Lab notes: Integrates north and south bridge functions on a single chip for cheap SDRAM systems.

SiS 735

Memory support: PC100, PC133, DDR200, DDR266; 1.5GB max
CPU support: Athlon, Duron, Athlon XP
Bus speed: 200MHz, 266MHz
I/O interconnect: MuTIOL, 1.2GB/s
MAX ATA support: 100
Lab notes: With built-in LAN and performance rivaling the KT266A, this is a solid single-chip DDR solution.

SiS 745

Memory support: DDR200, DDR266, DDR333; 3GB max
CPU support: Athlon, Duron, Athlon XP
Bus speed: 200MHz, 266MHz
I/O interconnect: MuTIOL, 1.2GB/s
MAX ATA support: 100
Lab notes: Drops the 735's integrated Ethernet, but adds FireWire and DDR333 support.

nVidia nForce 420-D

Memory support: DDR200, DDR266, 1.5GB max
CPU support: Athlon, Duron, Athlon XP
Bus speed: 200MHz, 266MHz
I/O interconnect: HyperTransport, 800MB/s
MAX ATA support: 100
Lab notes: Sports realtime Dolby Digital 5.1 encoding, built-in GeForce2-level graphics, and 128-bit memory support.

nVidia nForce 415-D

Memory support: DDR200, DDR266; 1.5GB max
CPU support: Athlon, Duron, Athlon XP
Bus speed: 200MHz, 266MHz
I/O interconnect: HyperTransport, 800MB/s
MAX ATA support: 100
Lab notes: A cheaper version of the 420-D that lacks integrated graphics.

nVidia nForce2

Memory support: DDR200, DDR266, DDR333, DDR400; 3GB max
CPU support: Athlon, Duron, Athlon XP
Bus speed: 200MHz, 266MHz, 333MHz
I/O interconnect: HyperTransport, 800MB/s
MAX ATA support: 133
Lab notes: Boasts built-in GeForce4 MX-level graphics and DDR400 compatibility. The first Athlon chipset to officially support a 333MHz FSB.

ATI Radeon IGP 320

Memory support: DDR200, DDR266; 1GB max
CPU support: Athlon, Duron, Athlon XP
Bus speed: 200MHz, 266MHz
I/O interconnect: A-Link, 266MB/s
MAX ATA support: 100
Lab notes: ATI's Athlon chipset includes Radeon-level graphics and USB 2.0.

PENTIUM 4 CHIPSETS:

Intel 845

Memory support: DDR200, DDR266; 3GB max
CPU support: P4, P4A
Bus speed: 400MHz
I/O interconnect: Hub Architecture, 266MB/s
MAX ATA support: 100
Lab notes: The original 845 was originally limited to SDRAM support, but Intel eventually added DDR200 and DDR266 support as well.

Intel 845E

Memory support: DDR200, DDR266; 2GB max
CPU support: P4, P4A, P4B
Bus speed: 400MHz, 533MHz
I/O interconnect: Hub Architecture, 266MB/s
MAX ATA support: 100
Lab notes: Responding to criticism that RDRAM is too costly, this chipset brings DDR support to the P4.

Intel 845PE

Memory support: DDR266, DDR333; 2GB max
CPU support: P4, P4A, P4B
Bus speed: 400MHz, 533MHz
I/O interconnect: Hub Architecture, 266MB/s
MAX ATA support: 100
Lab notes: Includes DDR333 support, but not AGP 8x support.

Intel 845GE

Memory support: DDR266, DDR233; 2GB max
CPU support: P4, P4A, P4B
Bus speed: 400MHz, 533MHz
I/O interconnect: Hub Architecture, 266MB/s
MAX ATA support: 100
Lab notes: The increased bandwidth of DDR333 gives the integrated "Extreme Graphics" in this chipset a little more boost.

Intel 845GV

Memory support: DDR266, DDR333; 2GB max
CPU support: P4, P4A, P4B
Bus speed: 400MHz, 533MHz
I/O interconnect: Hub Architecture, 266MB/s
MAX ATA support: 100
Lab notes: Think of this as the 810 of the

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THE MEGAHERTZ RACE

AMD trounced Intel in June 2000 when it pushed the classic Athlon to the historic 1GHz mark. Since then, however, the two companies have been locked in a bitter battle, with Intel gaining the upperhand (in clock speeds, at least) once it released the Pentium 4. To give you some perspective on the race to the 3GHz finish line, we dug into our archives to track just who launched what and when.

Please note that all AMD Athlon XPs are referred to by their performance ratings. For example, the 2800+ runs at 2.25GHz.

INTEL	DATE INTRODUCED
Pentium 4B 2.8GHz, 2.66GHz, 2.60GHz, 2.50GHz	August 26, 2002
Pentium 4B 2.53GHz	May 6, 2002
Pentium 4A 2.40GHz	April 2, 2002
Pentium 4A 2.2GHz	January 7, 2002
Pentium 4 2GHz, 1.9GHz	August 27, 2001
Pentium 4 1.8GHz, 1.6GHz	July 2, 2001
Pentium 4 1.7GHz	April 23, 2001
Pentium 4 1.5GHz, 1.4GHz	November 20, 2000

AMD	DATE INTRODUCED
Athlon XP model 2800 (2.25GHz) , Athlon XP model 2700 (2.17GHz)	October 2002
Athlon XP model 2600 (2.13GHz), Athlon XP model 2400 (2GHz)	August 21, 2002
Athlon XP model 2200+ (1.8GHz)	June 10, 2002
Athlon XP model 2100+ (1.73GHz)	March 13, 2002
Athlon XP model 2000+ (1.67GHz)	January 7, 2002
Athlon XP model 1900+ (1.6GHz)	November 5, 2001
Athlon XP model 1800+ (1.53GHz), Athlon XP model 1700+ (1.47GHz), Athlon XP model 1600+ (1.4GHz), Athlon XP Model 1500+ (1.33GHz)	October 9, 2001
Athlon 1.4GHz	June 6, 2001
Athlon 1.33GHz	March 21, 2001
Athlon 1.2GHz	October 17, 2000
Athlon 1.1GHz	August 14, 2000
Athlon 1GHz	June 5, 2000

P4 chipset family. It includes integrated graphics, but is intended for boards lacking AGP slots. Also lacks DDR333 support.

Intel 850

Memory support: PC600, PC800; 2GB max
CPU support: P4, P4A
Bus speed: 400MHz
I/O interconnect: Hub Architecture, 266MB/s
MAX ATA support: 100
Lab notes: The original RDRAM chipset for the P4 has remained a contender.

Intel 850E

Memory support: PC600, PC800; 2GB max
CPU support: P4, P4A, P4B
Bus speed: 400MHz, 533MHz
I/O interconnect: Hub Architecture, 266MB/s
MAX ATA support: 100
Lab notes: This chipset supports RDRAM and PC1066 RDRAM.

VIA P4X266

Memory support: PC100, PC133, DDR200, DDR266; 4GB max
CPU support: P4, P4A
Bus speed: 400MHz
I/O interconnect: V-Link, 266MB/s
MAX ATA support: 100
Lab notes: This chipset was made without a license, landing the company in a lawsuit from Intel. Slower than the 845E, too.

VIA P4X266A

Memory support: PC100, PC133, DDR200, DDR266; 4GB max
CPU support: P4, P4A
Bus speed: 400MHz
I/O interconnect: V-Link, 266MB/s
MAX ATA support: 133
Lab notes: Refines the P4X266's memory controller and adds ATA/133, but still lacks a license.

VIA ProSavage P4M266

Memory support: PC100, PC133, DDR200, DDR266; 4GB max
CPU support: P4, P4A
Bus speed: 400MHz
I/O interconnect: V-Link, 266MB/s
MAX ATA support: 133
Lab notes: Adds integrated S3 ProSavage8 graphics to the P4X266A chipset.

VIA P4X400

Memory support: DDR266, DDR333; 32GB max
CPU support: P4, P4A, P4B
Bus speed: 400MHz, 533MHz
I/O interconnect: V-Link, 533MB/s
MAX ATA support: 133
Lab notes: This is really the P4X333A with unofficial support for DDR400, 8x AGP, and USB 2.0. Unfortunately, there's still no license from Intel.

SiS 645

Memory support: PC133, DDR200, DDR266, DDR333; 3GB max
CPU support: P4, P4A
Bus speed: 400MHz
I/O interconnect: MuTIOL, 533MB/s
MAX ATA support: 100
Lab notes: The first DDR333 chipset for the Pentium 4.

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DDR266,

SiS 64

Mem MB/s

DD

e 645 tacks

nd ups the

R200, DDR266;

4A

MHz

nect: MuTIOL, 533MB/s

A support: 100

notes: Intended for mini-PCs and cost-conscious OEMs, this chipset bears similarities to the SiS 645 but adds integrated graphics.

SiS 648

Memory support: DDR200, DDR266, DDR333; 3GB max
CPU support: P4, P4A, P4B
Bus speed: 400MHz, 533MHz
I/O interconnect: MuTIOL 1G, 1GB/s
MAX ATA support: 133
Lab notes: Set to challenge the 850E with AGP 8x compliance and integrated Ethernet and FireWire.

SiS R658

Memory support: PC600, PC800, PC1066; 4GB max
CPU support: P4, P4A, P4B
Bus speed: 400MHz, 533MHz
I/O interconnect: MuTIOL 1G, 1GB/s
MAX ATA support: 133
Lab notes: The first non-Intel RDRAM chipset is also the first to officially support PC1066 memory. Other perks include AGP 8x and built-in Ethernet and FireWire.

ATI Radeon IGP 330

Memory support: DDR200, DDR266; 1GB max
CPU support: P4, P4A
Bus speed: 400MHz
I/O interconnect: A-Link, 266MB/s
MAX ATA support: 100
Lab notes: Targeting budget OEMs, the Pentium 4 version of the IGP 320 is held back by a lack of support for the 533MHz FSB.

ATI Radeon IGP 340

Memory support: DDR200, DDR266; 1GB max
CPU support: P4, P4A, P4B
Bus speed: 400MHz, 533MHz
I/O interconnect: A-Link, 266MB/s
MAX ATA support: 100
Lab notes: Adds support for a 533MHz bus speed.

ALi ALADDiN-P4

Memory support: PC100, PC133, DDR200, DDR266, DDR333; 3GB max
CPU support: P4, P4A
Bus speed: 400MHz
I/O interconnect: PCI, 133MB/s
MAX ATA support: 133
Lab notes: This P4 chipset from ALi hasn't managed to achieve popularity. ■

ATHLON XPs DECODED!

Can't figure out what the heck a 2400+ is? Then use our handy-dandy decoding chart to help you wade through AMD's mystifying model classifications.

MODEL NAME	CLOCK SPEED	BUS SPEED	PROCESS	CODE-NAME
Athlon XP model 2800+	2.25GHz	333MHz	0.13	Thoroughbred B
Athlon XP model 2700+	2.17GHz	333MHz	0.13	Thoroughbred B
Athlon XP model 2600+	2.13GHz	266MHz	0.13	Thoroughbred B
Athlon XP model 2400+	2GHz	266MHz	0.13	Thoroughbred B
Athlon XP model 2200+	1.8GHz	266MHz	0.13	Thoroughbred A
Athlon XP model 2100+	1.73GHz	266MHz	0.18	Palomino*
Athlon XP model 2000+	1.67GHz	266MHz	0.18	Palomino*
Athlon XP model 1900+	1.6GHz	266MHz	0.18	Palomino*
Athlon XP model 1800+	1.53GHz	266MHz	0.18	Palomino*
Athlon XP model 1700+	1.47GHz	266MHz	0.18	Palomino*
Athlon XP model 1600+	1.4GHz	266MHz	0.18	Palomino*
Athlon XP model 1500+	1.33GHz	266MHz	0.18	Palomino*

*Eventually all Athlon XPs will use the improved Thoroughbred B process.

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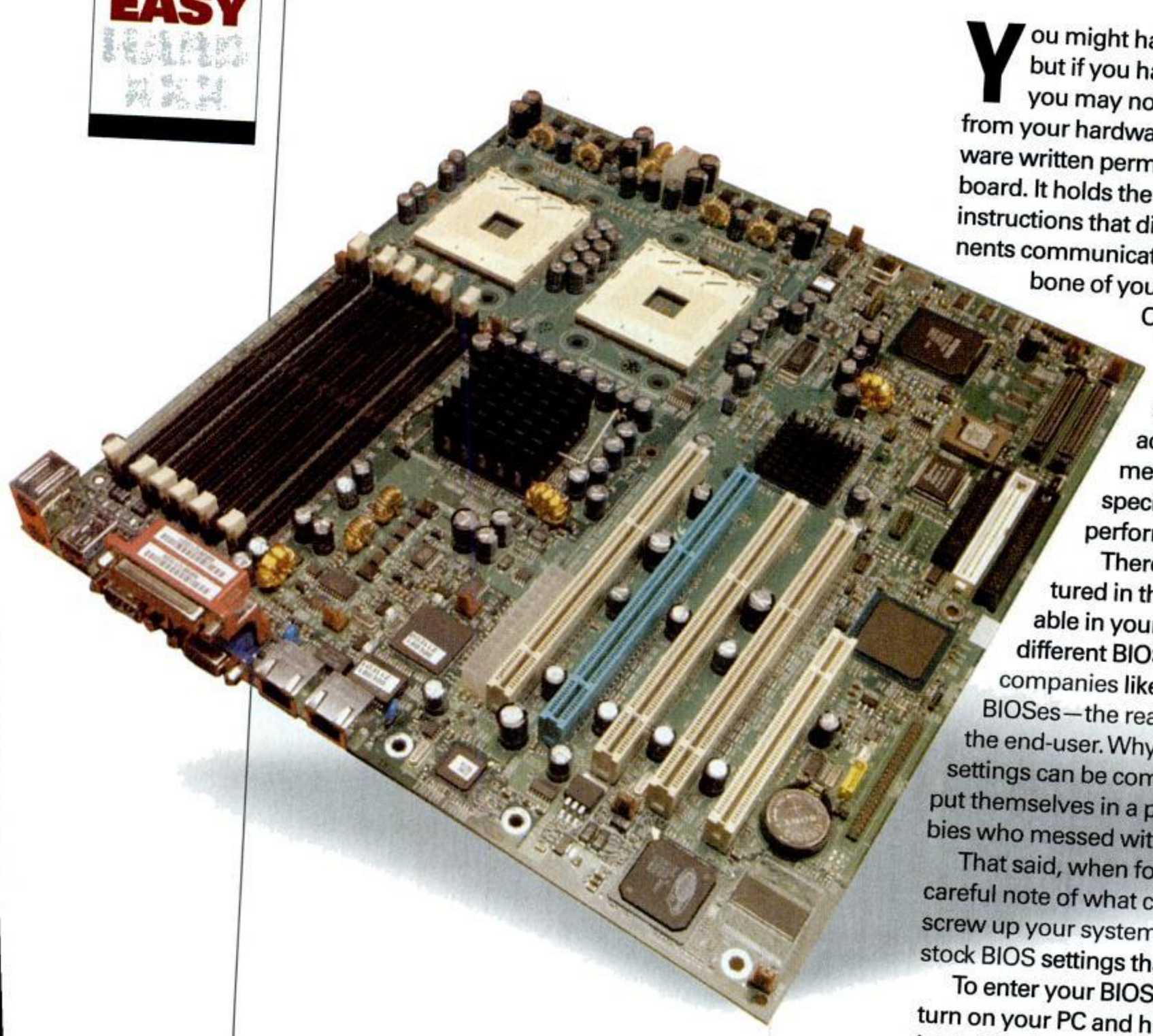
How To...

TWEAK YOUR BIOS

Let's dig deep into your motherboard's most arcane settings. Faster performance may be just a keystroke away!

MAXIMUMPC
DIFFICULTY RATING
EASY

BY TUAN NGUYEN



You might have the world's fastest CPU and system bus, but if you haven't paid attention to your BIOS settings, you may not be getting the absolute most performance from your hardware. Your system BIOS is a small piece of software written permanently onto a microchip on your motherboard. It holds the vital "basic input and output system" instructions that dictate how your different hardware components communicate with each other. Your BIOS is the backbone of your computer.

Optimizing a computer at its roots—the BIOS—is the best place to start. The BIOS lets you adjust a lot of boring settings such as time and date, but it also grants access to a lot of advanced features such as memory timing and AGP writes. Tweak these special areas properly, and you might get a nice performance boost.

There's just one rub: Not all the settings featured in the next few pages will necessarily be available in your PC's BIOS. Different features appear in different BIOS versions, and many PCs from big-name companies like Dell and HP come with feature-limited BIOSes—the really interesting settings are hidden from the end-user. Why? Because mucking around with BIOS settings can be complicated, and the big OEMs don't want to put themselves in a position where they have to bail out newbies who messed with settings they didn't understand.

That said, when following the steps in this article, take careful note of what changes you've made! This way, if you screw up your system somehow, you can always return to the stock BIOS settings that came with your PC.

To enter your BIOS screen (often called "Entering Setup"), turn on your PC and hit F1, F2, or Delete before your computer loads Windows. Once you're inside the BIOS, you can hunt for the settings mentioned in this article. We can't tell you specifically where to go, because all BIOS interfaces are different.

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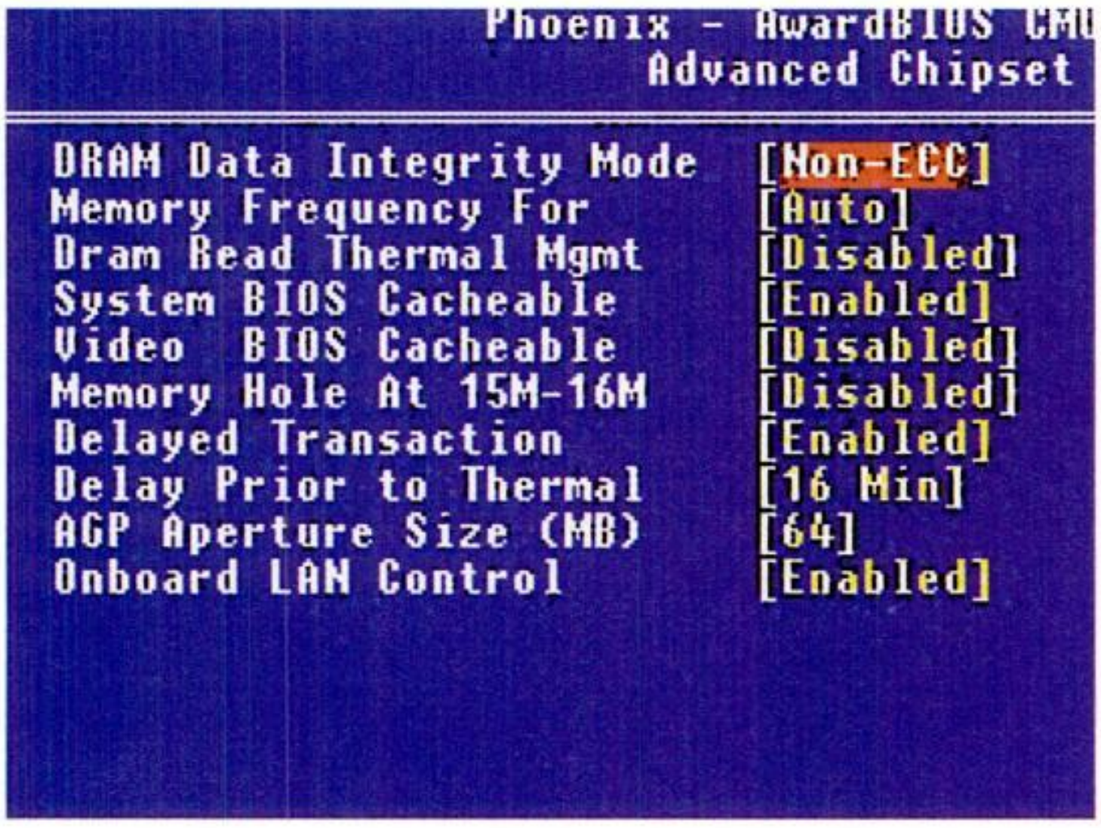
Step 1: L2 Cache ECC Checking & Gate A20

One of the most common settings that everyone should enable is CPU L2 Cache. L2 cache is a type of high-speed memory that's either closely coupled with the CPU core, or directly integrated in the CPU core. Whenever your CPU needs to munch on a specific instruction or piece of data, it first looks in L2 cache. If it can't find what it's looking for in L2 cache, it then turns to see if the data is hiding in main system memory—a much slower proposition. Because L2 cache is the fastest supplier of "CPU food," it must be enabled in the BIOS.

For the ultimate in speed, you can also try disabling L2 cache ECC checking. This feature allows L2 cache to perform self-diagnostics on its data. Because it takes time to do these tests, you may incur a slight performance hit if ECC is enabled.

Of course, there will always be times when your CPU needs to access slower system memory, so you'll want to let it do so as quickly as possible. To this end, enable fast Gate A20. This option allows your motherboard chipset to access system memory a bit more quickly.

Phoenix - AwardBIOS CMOS
Advanced BIOS Feat
Virus Warning [Disabled]
CPU L1 & L2 Cache [Enabled]
CPU L2 Cache ECC Checking [Enabled]
Quick Power On Self Test [Enabled]
First Boot Device [Floppy]
Second Boot Device [HDD-0]
Third Boot Device [CDROM]
Boot Other Device [Enabled]
Swap Floppy Drive [Disabled]
Boot Up Floppy Seek [Enabled]
Boot Up NumLock Status [On]
Gate A20 Option [Fast]
Typematic Rate Setting [Disabled]
x Typematic Rate (Chars/Sec) 6
x Typematic Delay (Msec) 250
Security Option [Setup]


Phoenix - AwardBIOS CMO
Advanced Chipset
DRAM Data Integrity Mode [Non-ECC]
Memory Frequency For [Auto]
Dram Read Thermal Mgmt [Disabled]
System BIOS Cacheable [Enabled]
Video BIOS Cacheable [Disabled]
Memory Hole At 15M-16M [Disabled]
Delayed Transaction [Enabled]
Delay Prior to Thermal [16 Min]
AGP Aperture Size (MB) [64]
Onboard LAN Control [Enabled]

Step 2: Optimizing Cache and AGP Aperture

L2 cache can also be used to cache your system BIOS and videocard BIOS—but don't do it. When you're actually working in the Windows environment, you have no need for any of your system BIOS to be shadowed in L2 cache. And if it is shadowed, your L2 capacity will be reduced, thus less performance for tasks that really do need your PC's attention. The same holds true for shadowing your videocard's BIOS in L2 cache. Sure, if you still spend your time playing old DOS games, or maybe even running DOS itself, video BIOS caching may prove useful. But if you game in Windows like everyone else, you should leave this feature disabled for better L2 cache performance.

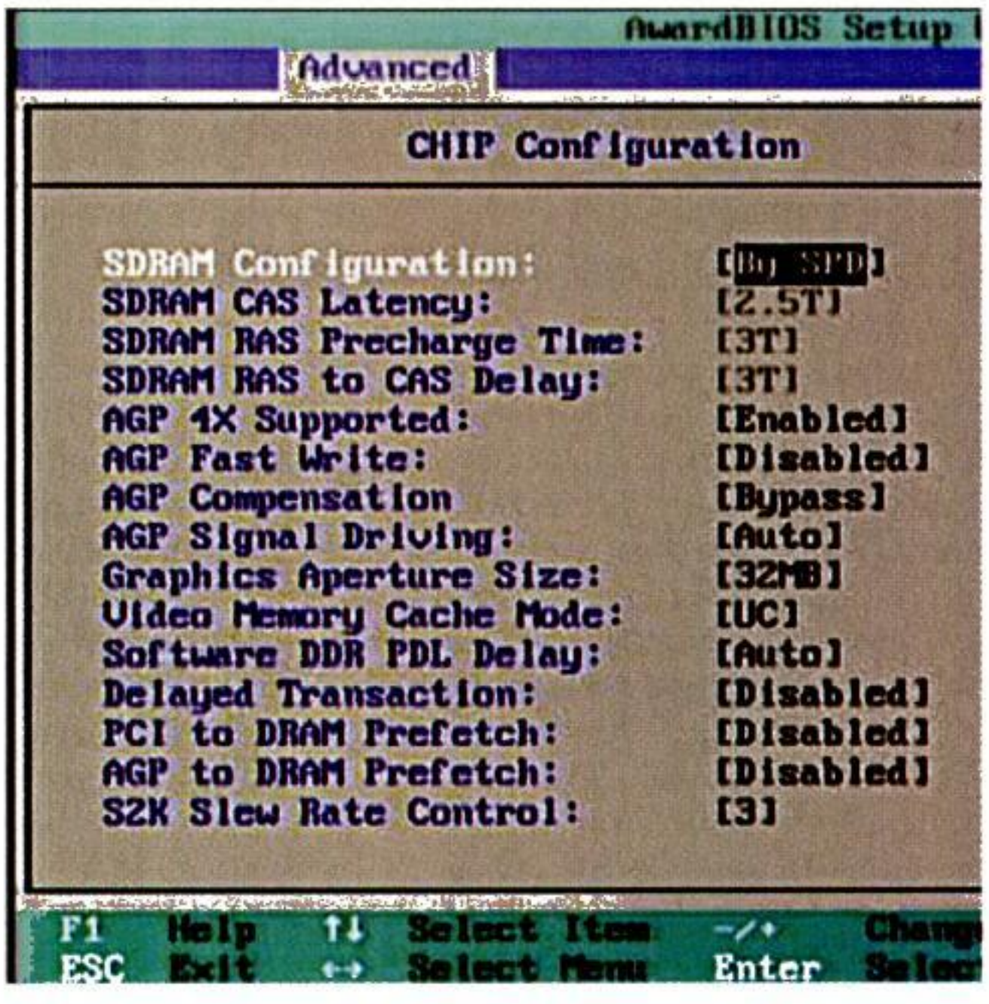
Now that L2 cache is optimized for the fastest performance, it would be a shame if your graphics card was writing and reading to main memory slower than need be. To this end, you'll want to set your AGP Aperture size for efficient memory use. AGP Aperture size affects the amount of total memory that's addressed by the AGP bus. If you have a 64MB videocard, set the aperture size to 64MB. If you have a 32MB card, set the aperture size to 128MB.

Step 3: Tweaking Your Memory

One of the most tweakable items inside the BIOS is CAS Latency Timing. This setting affects the speed at which your motherboard's core-logic chipset and main system memory communicate. You see, when your mobo's chipset sends a read request to memory, the request isn't acted upon immediately. The time delay between when the memory receives the request and when it acts upon the request is called CAS latency. Naturally, you'll want to lower the latency time to increase memory performance. However, some memory modules can't handle a CAS latency time that's set too low, so before you lower your CAS latency setting, make sure your memory is up to the task. For example, the best sticks of DDR memory currently boast a CAS setting of 2 (the norm is 2.5).

Even if you have low-latency memory, it may pay to choose a higher setting in your BIOS. Why? Because a higher CAS latency setting may allow your memory to run at higher frequencies, and this has a bearing in overclocked systems. That said, if you managed to get your hands on very high-quality memory modules, you still may be able to lower the CAS latency even if you overclock.

Another interesting BIOS tweak involves enabling the AGP Fast Write feature. This allows your videocard to quickly write data to system memory. Many recent games come packed with large textures, so it's imperative that those textures be stored and accessed in a timely manner. Frequently the hiccups you get while chasing someone down in *Serious Sam* are caused by slow texture load times.


AwardBIOS Setup
Advanced
CHIP Configuration
SDRAM Configuration: [By SPD]
SDRAM CAS Latency: [2.5T]
SDRAM RAS Precharge Time: [3T]
SDRAM RAS to CAS Delay: [3T]
AGP 4X Supported: [Enabled]
AGP Fast Write: [Disabled]
AGP Compensation [Bypass]
AGP Signal Driving: [Auto]
Graphics Aperture Size: [32MB]
Video Memory Cache Mode: [UC]
Software DDR PDL Delay: [Auto]
Delayed Transaction: [Disabled]
PCI to DRAM Prefetch: [Disabled]
AGP to DRAM Prefetch: [Disabled]
S2K Slew Rate Control: [3]
F1 Help ↑↓ Select Item -/+ Chang
ESC Exit ↔ Select Menu Enter Selec

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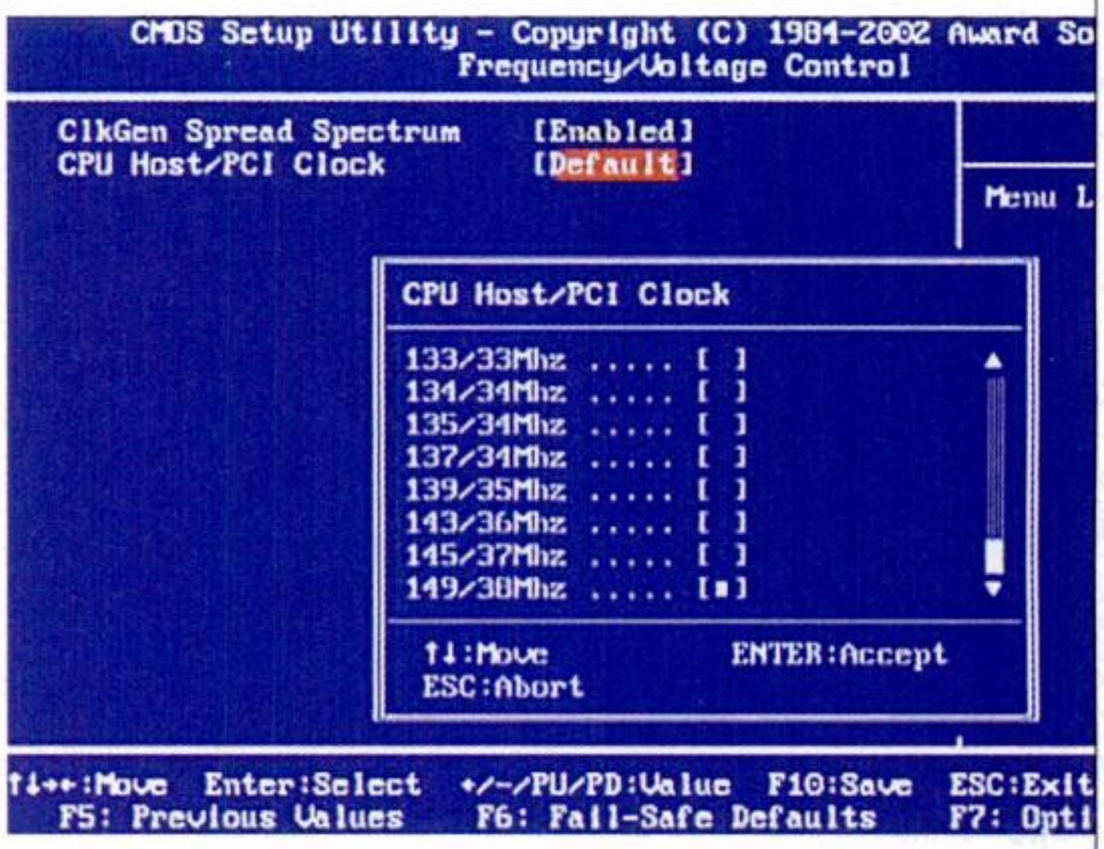
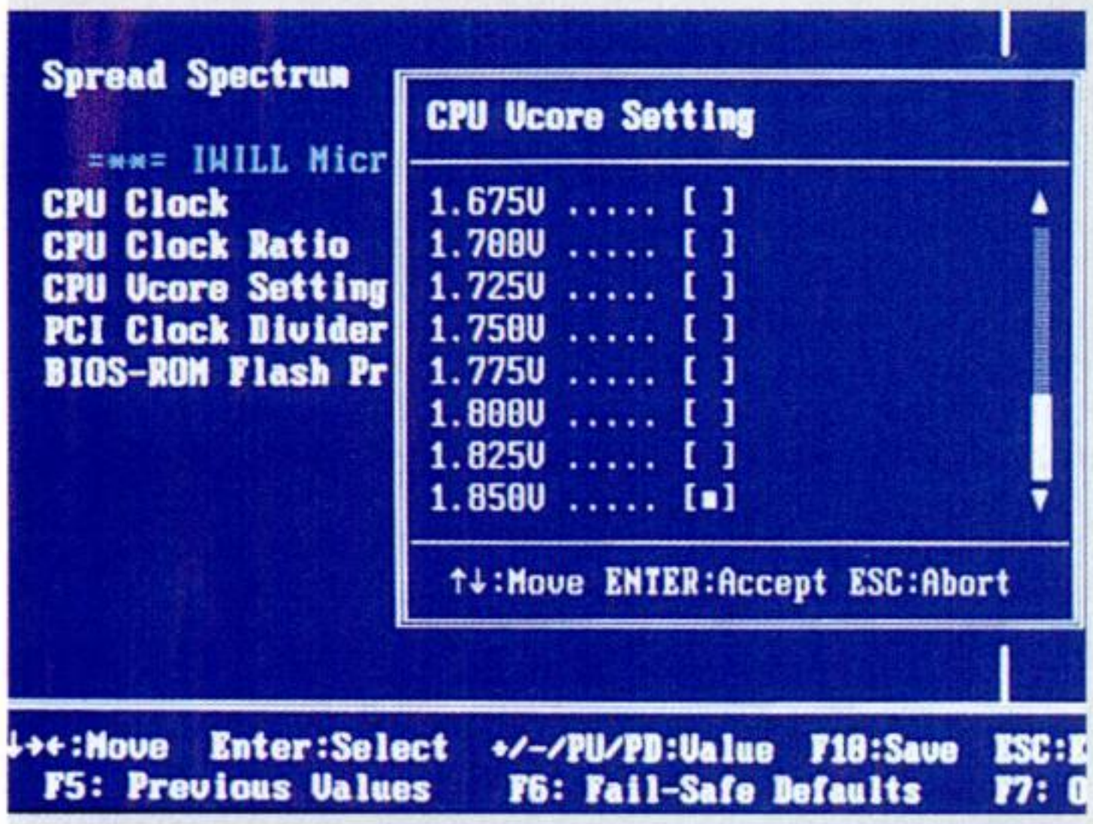
Step 4: Overclocking Your Frontside Bus

In some of the better BIOS implementations we've seen, there are settings to overclock both your system's frontside bus (FSB) and CPU's core frequency. The easiest way to increase overall system performance is to increase FSB speed. Because the CPU gets its final speed by multiplying a number by the FSB frequency, increasing the FSB frequency will also increase the CPU frequency. (Overclocking is explained in greater depth on page 30.)

Just be careful not to drive your FSB settings through the roof too quickly. Take things slowly and increase the settings gradually until your system becomes unstable. At that point, you'll want to slowly throttle backwards until your system is completely stable again. This will be your optimum FSB setting. Most CPUs will be clock ratio–locked, so messing around with your BIOS's Clock Ratio feature probably won't do you any good.

FSB overclocking does have its drawbacks in that it increases your PCI and AGP speeds as well. Your average 32-bit/33MHz PCI slot is designed to run at 33MHz, so going faster can cause problems (many PCI cards won't be able to handle the frequency increase). If you have a PCI Clock Divider feature in your BIOS, use it to set your PCI bus frequency as close to 33MHz as possible.





Step 5: Tweaking Your voltages

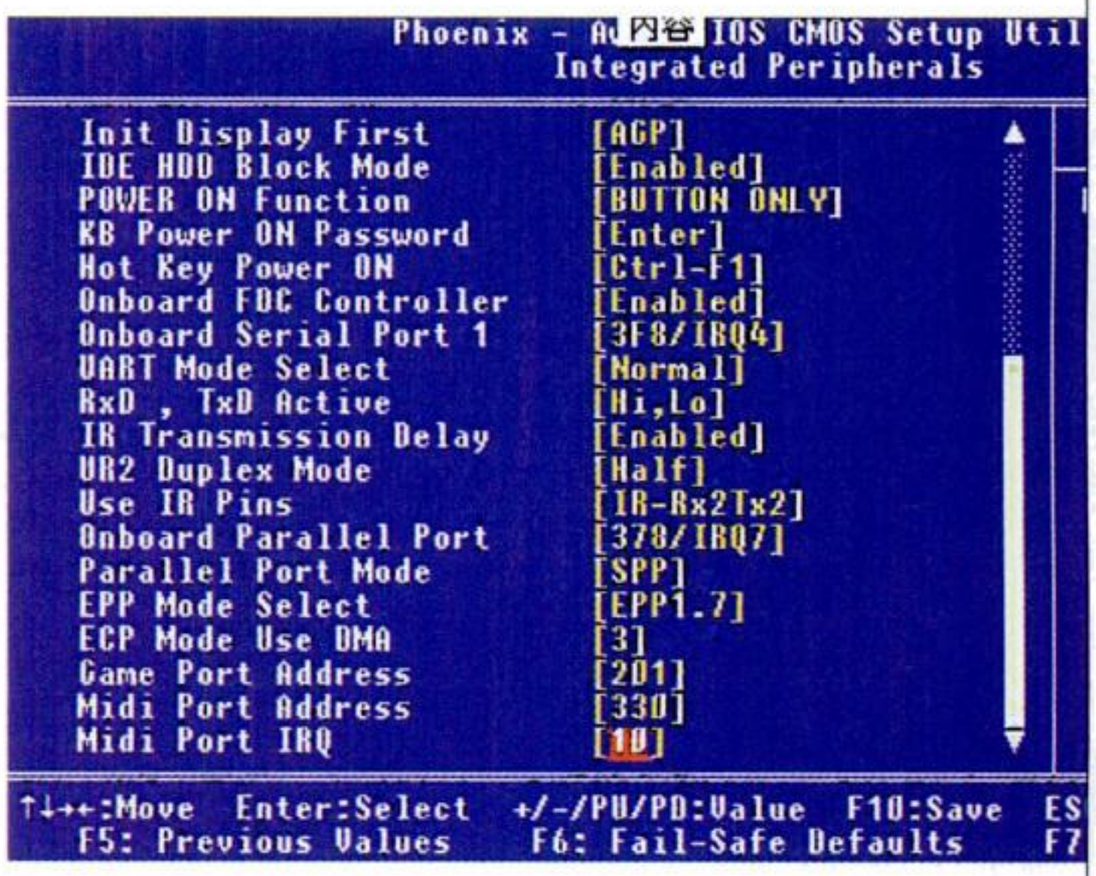
Many motherboard BIOSes come with settings to adjust your CPU's core voltage. Increasing the voltage can help an overclocked system run a little more reliably—or it can totally fry a CPU. The first thing you'll want to do is overclock your system a bit using the methods described in Step 4 of this article, or in the steps on pages 30-33. If you find stability is compromised by the overclocking, then you can tinker with the voltage settings.

Slowly adjust voltage settings one tick at a time, then check for stability. Frequently, your system won't even make it past the booting process if your CPU requires more juice. However, you must be careful not to turn up the power too much, or else you risk doing severe damage to your CPU and maybe even the motherboard. Before you tweak the voltage, you should ensure that you have adequate cooling installed on your CPU and in your case. Overheating is the number-one cause of unsuccessful overclocking. We recommend that you avoid increasing CPU core voltage any more than 0.4V.

Step 6: Disable Those Pesky Legacy Ports

Legacy port settings may seem like unlikely places to find performance increases, but in fact they're some of the most powerful features in any BIOS. Here's the deal: The legacy ports on virtually all motherboards are still tied to the dog-slow ISA bus (funny, considering that most of today's mobos lack ISA slots!). The Parallel and COM ports on your motherboard are resource hogs, and they should have been banished a long time ago. If you're not using any COM port or Parallel port devices, we recommend disabling these ports completely. This will free up system interrupts (IRQs), and will actually increase PCI bus performance. Because the ISA bus is much slower than the PCI bus, the PCI bus must wait for ISA requests to finish. To counteract this, many BIOSes include a feature called Delayed Transaction, which helps keep PCI data moving smoothly even while ISA devices are making data calls.

If you have a USB keyboard and mouse, you can also disable your PS/2 ports. USB devices ride the PCI bus, unlike those crusty old ISA-riding PS/2-based mice and keyboards. ■


Phoenix - A內容IOS CMOS Setup Util
Integrated Peripherals
Init Display First [AGP]
IDE HDD Block Mode [Enabled]
POWER ON Function [BUTTON ONLY]
KB Power ON Password [Enter]
Hot Key Power ON [Ctrl-F1]
Onboard FDC Controller [Enabled]
Onboard Serial Port 1 [3F8/IRQ4]
UART Mode Select [Normal]
RxD , TxD Active [Hi,Lo]
IR Transmission Delay [Enabled]
UR2 Duplex Mode [Half]
Use IR Pins [IR-Rx2Tx2]
Onboard Parallel Port [378/IRQ7]
Parallel Port Mode [SPP]
EPP Mode Select [EPP1.7]
ECP Mode Use DMA [3]
Game Port Address [201]
Midi Port Address [330]
Midi Port IRQ [10]
↑↓→←:Move Enter:Select +/-/PU/PD:Value F10:Save ES
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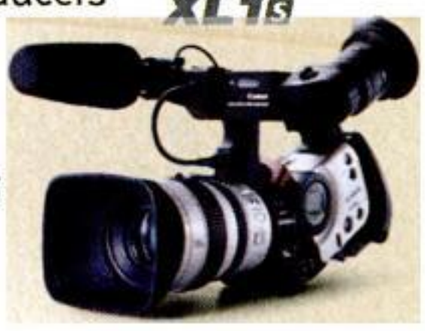

GL2

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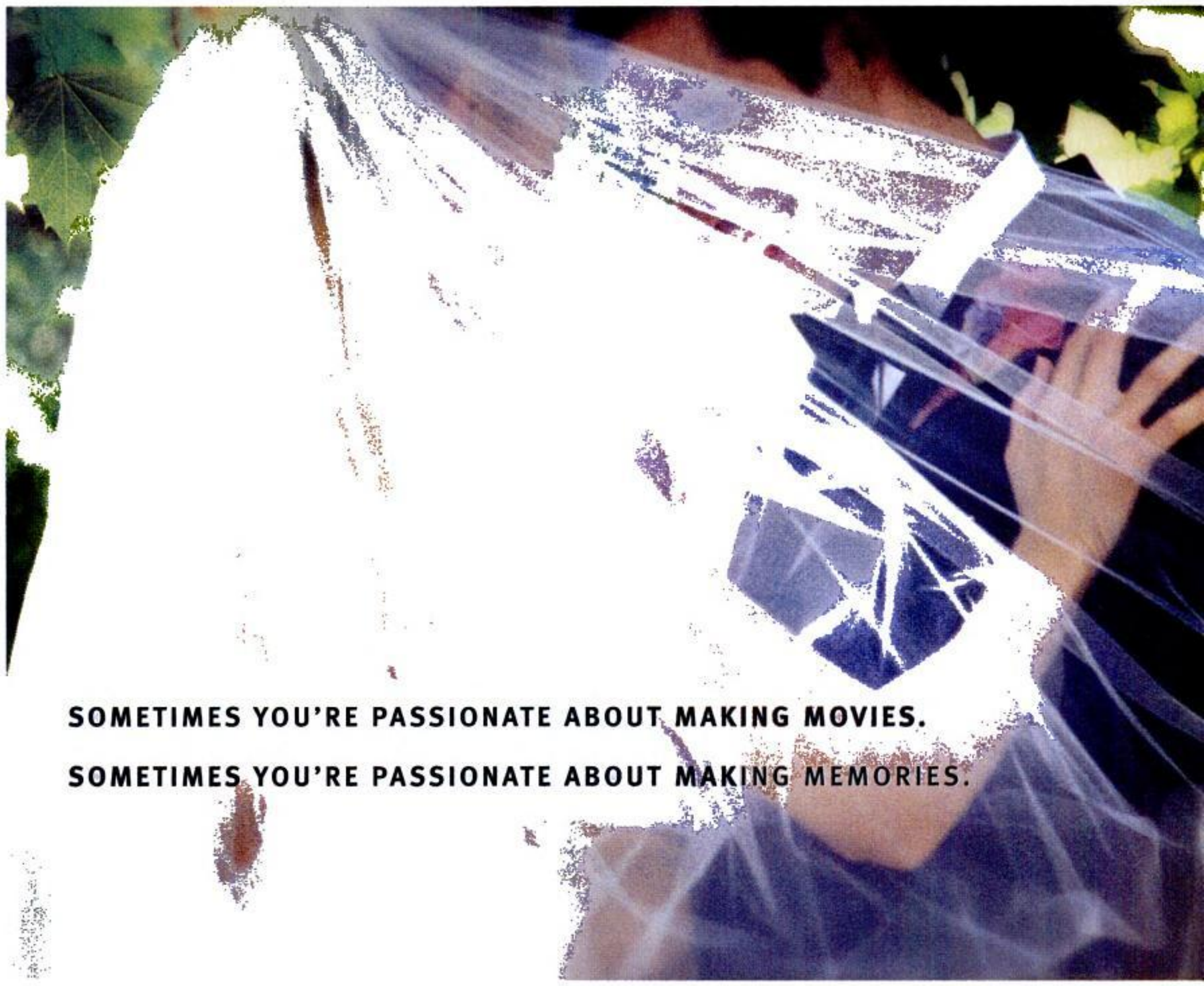

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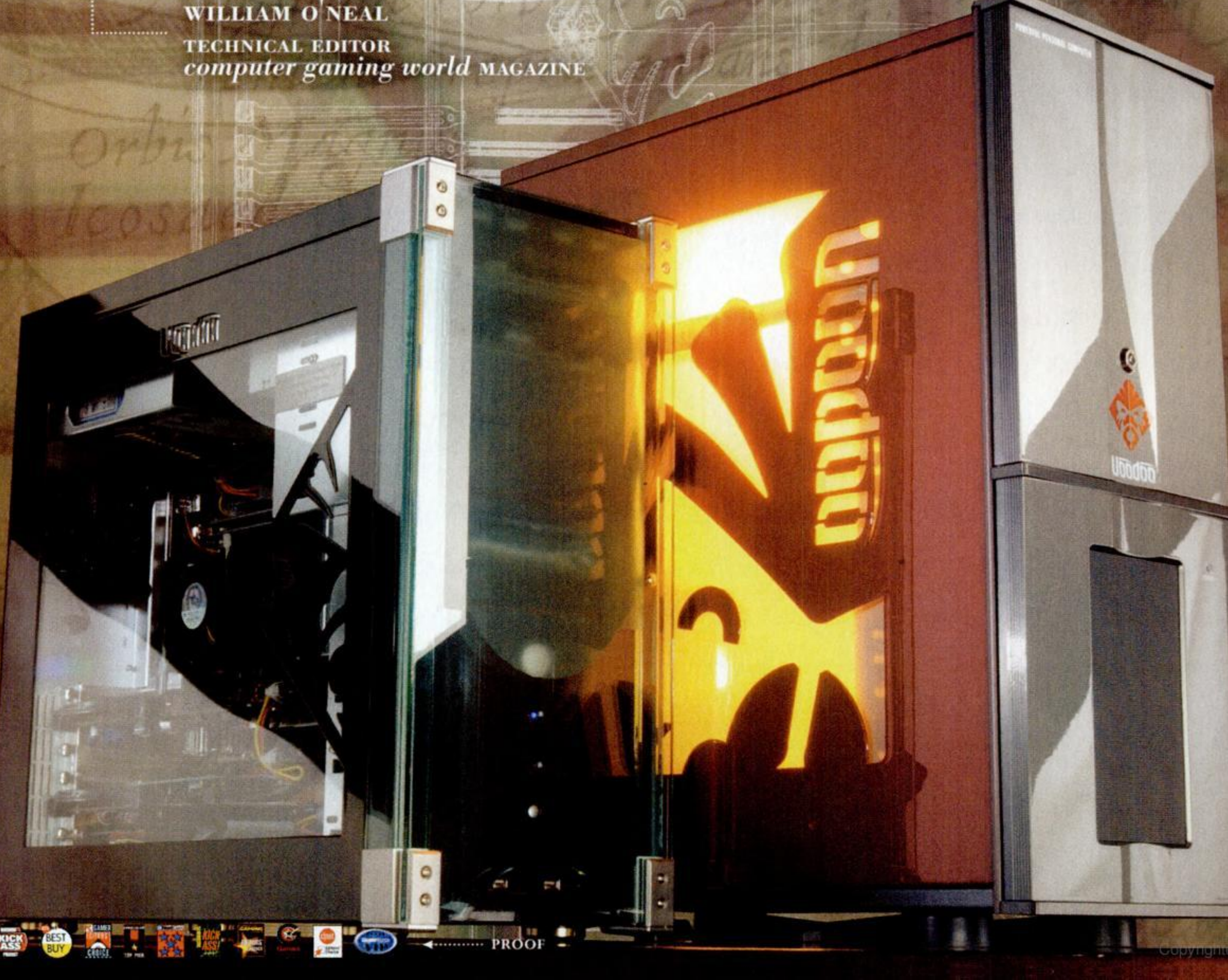

PROOF

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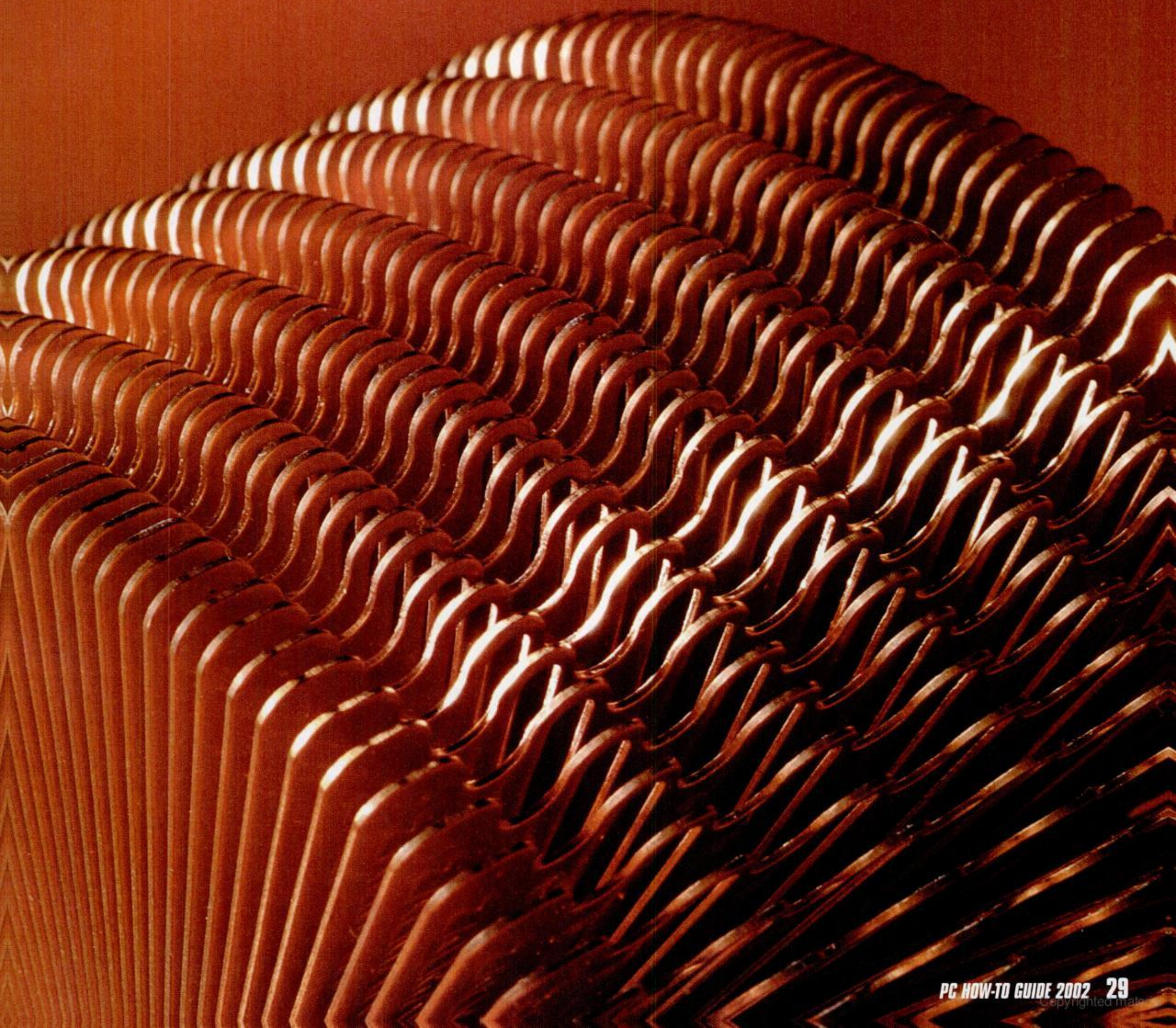
HARDWARE

Our hardware tour of duty begins with the definitive primer on **CPU overclocking**. The next step? Choosing the right **cooling devices**, but of course. In the following pages, we walk you through the process of actually **testing airflow**, lest you be left with any nagging cooling questions. We end this section with the definitive **case-painting** how-to to ensure your mod job is both cool-running *and* cool-looking.



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How To...

OVERCLOCK YOUR CPU

Four processors, four motherboards, four case studies, and one look at Athlon unlocking

BY OMEED CHANDRA

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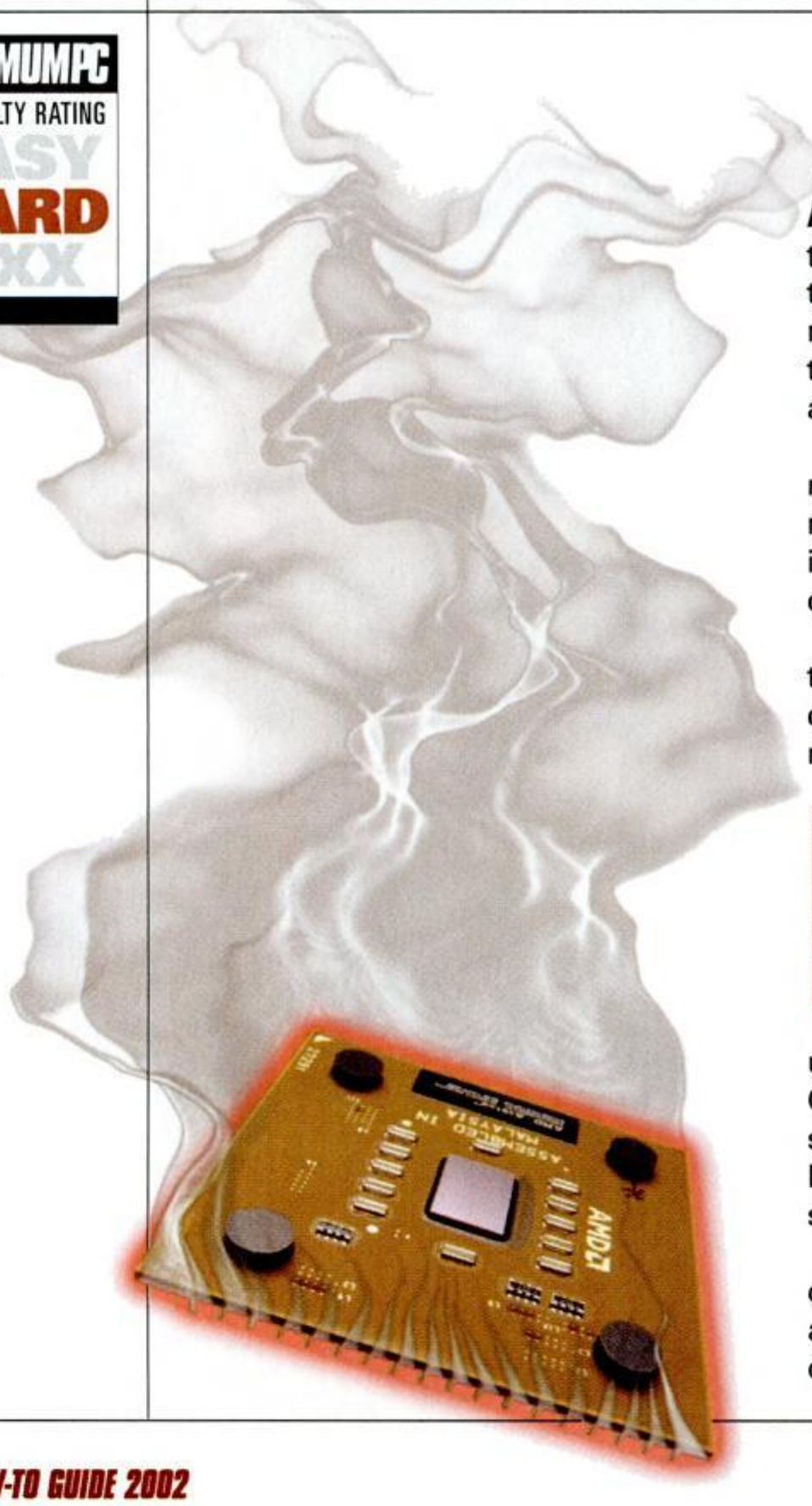

All PC processors are not created equal. Sure, your Pentium 4 and your buddy's Pentium 4 might both be clocked at 2GHz, but this is only because Intel rated the processors for 2GHz before the two CPUs left the factory. You see, every processor is tested and qualified for what amounts to its maximum "comfortable" speed—the speed at which the processor can run days on end without giving up the ghost. This is also the speed at which the manufacturer can reasonably guarantee 100 percent reliable performance (and thus reduce warranty claims).

But when it comes right down to it, every processor is a unique entity. One marked to run at 2GHz might actually run just fine at 2.2GHz, while another marked for 2.2GHz might not have any headroom at all. The determining factor is the processor's ability to maintain stable circuitry while running fast frequencies and enduring extreme heat.

CPUs manufactured during the launch of a new processing technology tend to have less frequency headroom than CPUs manufactured at the end of a processing technology's lifetime. Why? Because as the processing technology matures, the chip company works out various kinks and finds craftier and craftier ways to produce CPUs capable of running at faster speeds. So, for example, a 1.6GHz P4A manufactured at the launch of Intel's Northwood process technology might have much less frequency headroom than a 1.6GHz P4A manufactured at the end of the Northwood's run. And get this: It's quite typical for CPU companies to manufacture a whole slew of extremely capable processors, then mark some down to lower speed grades in order to fulfill orders for lower-priced CPUs! That's right—the processor that's been sitting inside your system for two years might actually have been created to run at faster speeds.

WARNING: **CPU overclocking can sometimes result in destroyed processors, motherboards, and other system components. Don't act on this how-to article unless you feel comfortable with the risks.**

So how do you help a CPU realize its maximum speed potential? By overclocking it, of course. In the following pages we'll teach you Overclocking 101, and walk you through four overclocking case studies. Glean everything you can from our Lab experiments, then apply your knowledge to a CPU at home.

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The Basics

So what is overclocking? Simply put, it's the practice of running a computer chip at a higher frequency than it's intended to run at. CPU overclocking can be accomplished in two ways: by increasing the speed of a system's frontside bus (FSB), and/or by changing the CPU's multiplier ratio. Because a CPU's frequency is determined by multiplying FSB speed with the multiplier ratio (for example, a 133MHz FSB paired with a 10x multiplier equals 1333MHz), you can increase the frequency by upping either value.

The overclocking process varies from motherboard to motherboard, but in most cases, important settings for frontside bus speed can be found in a system's BIOS. The multiplier ratio setting is often located here as well, but with some mobos, you can only change the multiplier ratio via a physical switch on the motherboard itself. Sometimes you also need to increase your CPU's core voltage; this setting usually hides in your BIOS as well. Consult your motherboard's user's manual for specifics on where your FSB, voltage, and multiplier settings might be hiding. (And see page 24 for more information on BIOS settings.)

Overclocking involves many risks, the least of which is invalidating the warranties on your processor and related system components. System instability is also a possibility, and in extreme cases, you could irreparably damage your computer—though this is usually caused by an inadequate cooling setup (overclocked parts invariably need increased cooling to run stable; see page 34 for cooling reviews).

Note that frontside bus overclocking is riskier than simply changing the CPU multiplier ratio, because on most mobos, every increase in FSB frequency also causes an increase in PCI bus frequency. If the PCI bus speed deviates too far from its 33MHz spec, some PCI devices may experience problems.

Is Your CPU a Prime Candidate?

As we stated above, "mature" CPU technologies tend to be more overclockable. For example, while the original Thoroughbred Athlon processors were made on a 0.13-micron process, they were often less overclockable than even 0.18-micron Palomino Athlons. However, AMD eventually refined its manufacturing process, which resulted in the much more overclockable Revision B Thoroughbred.

In general, Pentium 4s—especially 0.13-micron Northwood parts—can be overclocked significantly more than current Athlons. The 1.6GHz Northwoods have proven particularly compliant, and are often able to cross the 2GHz mark without much trouble. In contrast, you'd be lucky to get even an extra 100MHz out of many Athlons. The Athlon, however, does have one thing going for it: the ability to overclock using multipliers. All recent Intel and AMD processors sold to the general public are multiplier-locked, leaving the frontside bus as your only overclocking path. Intel processors cannot be unlocked, but most Athlons can be unlocked with a bit of finesse, making them quite popular with speed freaks.

That said, some lucky (or well-connected) individuals have managed to obtain unlocked P4 engineering samples. To see if you're the owner of a rare unlocked P4, head to your BIOS and try changing the multiplier ratio. If it works, thank the Processor God for making you one of the lucky ones.

When it comes to overclocking, motherboards are just as important as CPUs. Boards that allow FSB, multiplier ratio, and CPU core voltage tweaks are your friends. This means Intel-branded motherboards are *not* your friends. Good overclocking mobos also offer temperature monitoring and an emergency shutdown feature to help prevent CPU meltdown. Athlon XP/MP users should also seek out a motherboard that supports the thermal diode that's integrated onto the core of an AMD processor.

The very best motherboards include plenty of documentation on overclocking features, and also allow memory and FSB speeds to be set independently of one another. Since most mobos don't fall into this category, many speed freaks opt for memory that spec'd higher than the speed of their FSB (for example, they put DDR333 memory on a 266MHz bus). That way, even if the FSB is overclocked, the memory will still run within spec.

Preparations and Precautions

A few simple precautions can minimize the risks of overclocking. For one, you should ensure that your cooling setup—especially the CPU fan—is ready for increased heat. While Northwood P4s can often be overclocked considerably with just stock Intel cooling, the same cannot be said of Athlons and older, 0.18-micron Pentium 4s. For significant overclocking with these peskier processors, we strongly recommend investing in a more powerful heatsink/fan unit.

HOW TO IDENTIFY A CPU

Buying a CPU from a small local shop or a trade show vendor can save you money, but how do you know that you're really getting what you paid for? Fortunately, modern CPUs bear clear markings for easy identification. Even better, both AMD and Intel maintain online databases that allow you to determine a CPU's core voltage, process, and more, using just a serial number.

■ To identify a current AMD CPU (i.e., anything with an exposed core), examine the text engraved on the surface of the chip. The second line of text is the CPU's ordering part number (OPN). For example, A1333AMS3C represents a 1.33GHz Thunderbird Athlon. Check out the Technical Documentation section of www.amd.com for information on translating the specific OPN markings of the various AMD processors.

■ Intel's Processor Frequency ID utility can tell you whether your CPU is genuine and not remarked. It can be downloaded from www.intel.com/support/processors/procid. However, if you want more detailed information, such as the CPU's core voltage, you'll have to read the "sSpec" number off of the processor. The sSpec is a five-character string (such as RM3X8) that's printed on top of each Intel CPU. Locate this number, then head over to the Processor Spec Finder on Intel's web site at www.intel.com/support/processors/sspec/p4p.htm and find your particular sSpec.

Using a high-quality thermal compound is also important; our favorite is Arctic Silver (**www.arcticsilver.com**). Also, if you're planning on overclocking your FSB (and thus your memory) by a large margin, it may be worthwhile to buy memory heatsinks. Regardless of your cooling setup, it's wise to overclock in small increments. Don't try to jump straight from, say, 1.5GHz to 1.8GHz.

After overclocking a system, it's important to check for stability. The first test is booting up: If the system fails to boot properly, you may want to try bumping up the CPU core voltage, one increment at a time. If that doesn't help, decrease the clock speed. However, if your system does boot, and everything appears to run fine in an overclocked state, your next step should be running some resource-intensive programs to stress-test the system. *CPU Burn-in* is popular among overclockers. This useful app performs a series of intense floating-point calculations, and error-checks the results to detect subtle chinks in the armor of an overclocking job. If you're truly addicted to speed, the next thing you'll want to do is run some benchmarks to gauge the performance gain you've netted.

Let's Get Ready to Rumble

OK, now that you know the basics, it's time to look at some real-world overclocking scenarios. Next up you'll find five case studies involving common Pentium 4 and Athlon CPUs, as well as a brief look at methods of unlocking Athlon processors. Knock yourself out!

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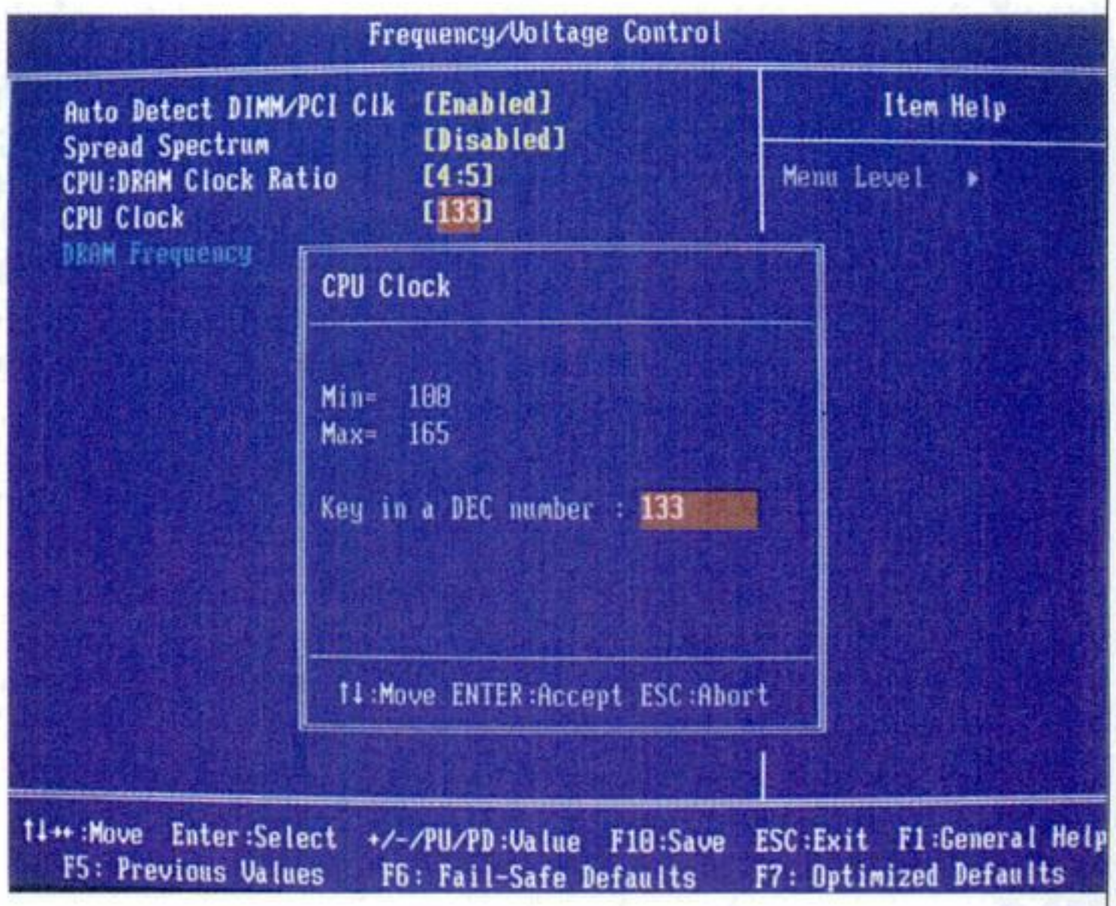
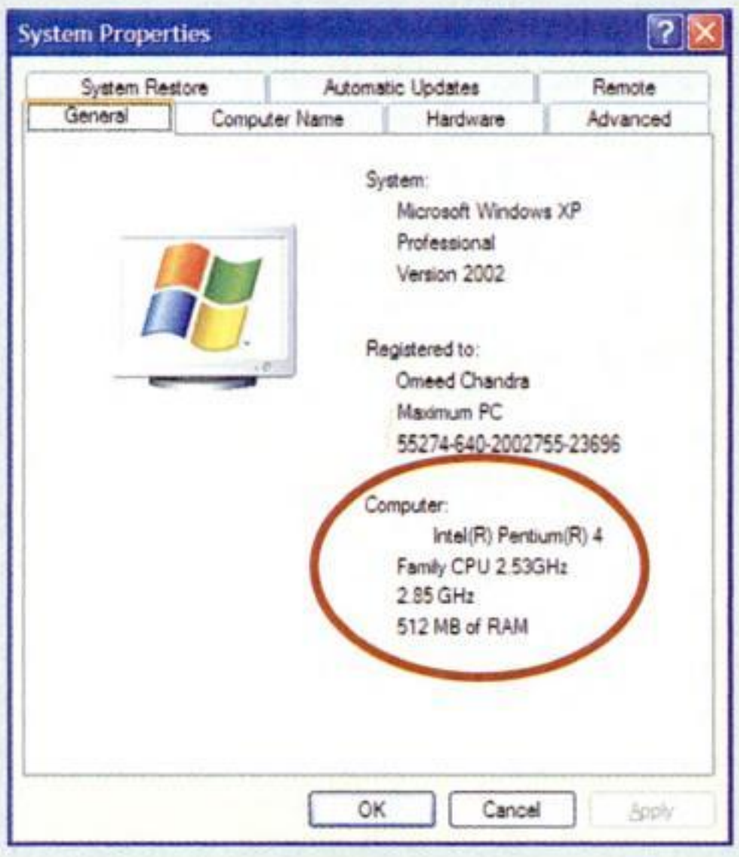
Case Study 1

■ **P4 NORTHWOOD 1.6GHZ TO 2.13GHZ IN SHUTTLE SS51 MINI-SYSTEM**

Like the Celeron of old, the 1.6GHz Northwood has earned a reputation as an overclocker's dream. With plenty of frequency headroom, thanks to its 0.13-micron manufacturing process, this processor is almost guaranteed to surpass 2GHz. We dropped this CPU into the FS51 motherboard of Shuttle's SS51 mini-system, which offers basic overclocking beef but no gravy. The board supports a 533MHz frontside bus (133MHz quad-pumped), but our CPU was designed for a 400MHz FSB. All the necessary overclocking settings were located in the mobo's Frequency/Voltage Control BIOS menu (see picture). Since the FS51's BIOS offers multiple memory-to-FSB speed ratios, we were able to run our 512MB of DDR333 memory at stock speed even with the FSB overclocked. We stepped up the FSB's frequency by about 5MHz at a time, going first to 105MHz, then 110MHz, and so on, eventually hitting our target of 133MHz (533MHz quad-pumped). True to its reputation, the Northwood didn't exhibit any problems running at 2.13GHz, even with no increase in core voltage. Our overclocking yielded impressive dividends, with *SYSmark2002* shooting from a lowly 173 to a very competitive 214, and the *3DMark* cumulative score jumping nearly 1,000 points.





Case Study 2

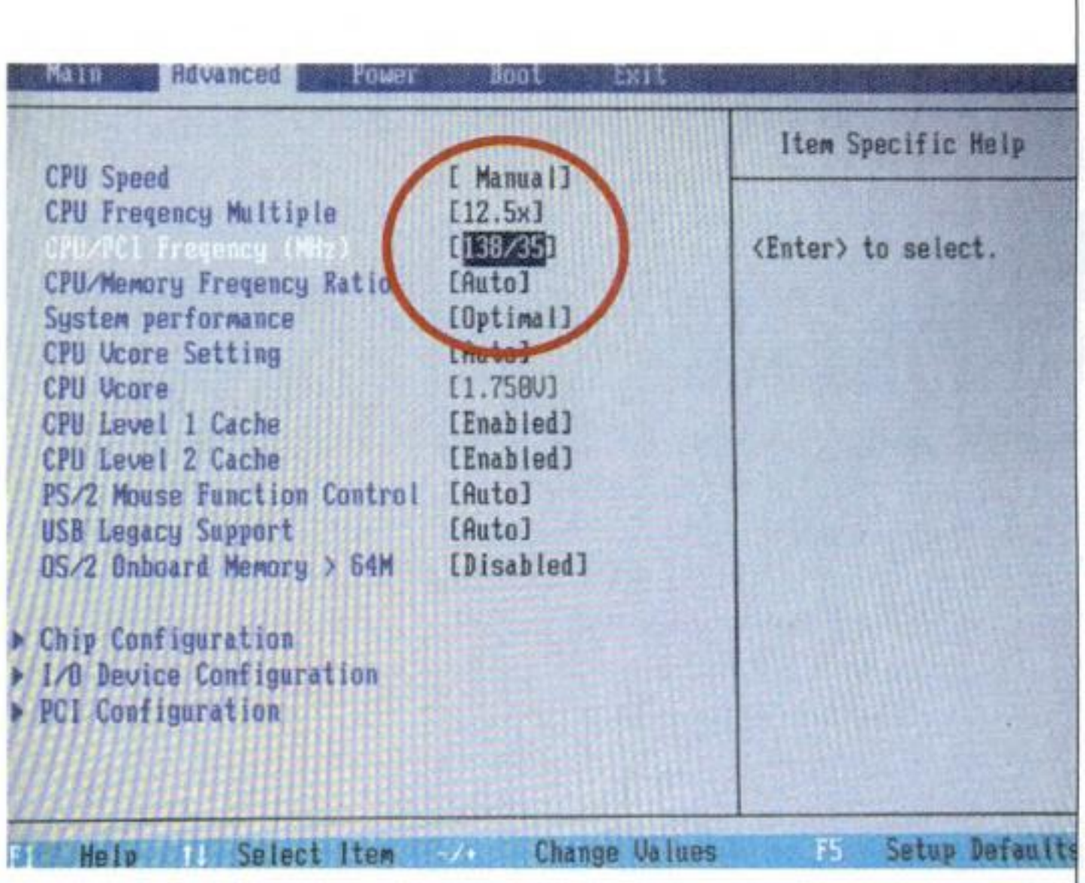
■ **P4 NORTHWOOD 2.53GHZ TO 2.85GHZ ON ASUS P4T533**

With its jaw-dropping array of bleeding-edge components, the magazine's Dream Machine 2002 could have kicked ass and taken names without being overclocked. But it wouldn't have been a true *Maximum PC* creation if it was clocked at stock speeds, and the Northwood still has plenty of headroom, even at 2.53GHz. Even though the P4 is a relatively cool-running processor, we replaced the stock Intel fan with an Alpha Novatech PAL-8942 overclocking heatsink and a 4000rpm fan before turning up the heat. The overclocker-friendly Asus P4T533 mobo provided the needed FSB, memory, and voltage settings in its BIOS. To be safe, we overclocked little by little. With some added voltage, we had the Northwood humming along at 2.85GHz on a 600MHz FSB (see screenshot). And despite RDRAM's poor overclocking reputation, our gigabyte of PC1066 ran problem-free at PC1200 speeds. We tried pushing the Dream Machine even farther, but turned back after encountering program crashes. Predictably, the benchmark results set several new records. *SYSmark2002* showed the greatest improvement from overclocking, shooting from an earthbound 261 to a stratospheric 304. With current OEM rigs hovering around 260 in this benchmark, nothing comes close.

Case Study 3

■ **ATHLON XP 1.67GHZ TO 1.73GHZ ON ASUS A7V333**

In this case study, we cranked an Athlon XP 2000+ (1.67GHz) to the rated speed of a 2100+ (1.73GHz) using only FSB overclocking. An Asus A7V333 mobo provided a stable platform for our task, but for minor increases in FSB speed, most any motherboard will do. Since we were planning on just a 5MHz increase in FSB speed, we didn't bother with exotic cooling. With the default multiplier of 12.5, we pushed the bus straight to 138MHz for a 1.73GHz CPU clock speed. Everything ran perfectly, with no trace of instability and no errors in *CPU Burn-in*. Though our rig used DDR333 SDRAM, it's unlikely that 266MHz memory would have had any trouble running at 276MHz. Our PCI devices, meanwhile, didn't object to such a small boost in PCI bus speed; we upped it from 33MHz to 35MHz (see screenshot). Benchmark results showed a slightly larger performance increase than can be expected from a simple 66MHz bin jump. With a little help from the 276MHz frontside bus, our system earned 192 in *SYSmark2002* and 10,850 in *3DMark2001*—up from 182 and 10,595, respectively.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PS/2 Mouse Function Control [Auto]
USB Legacy Support [Auto]
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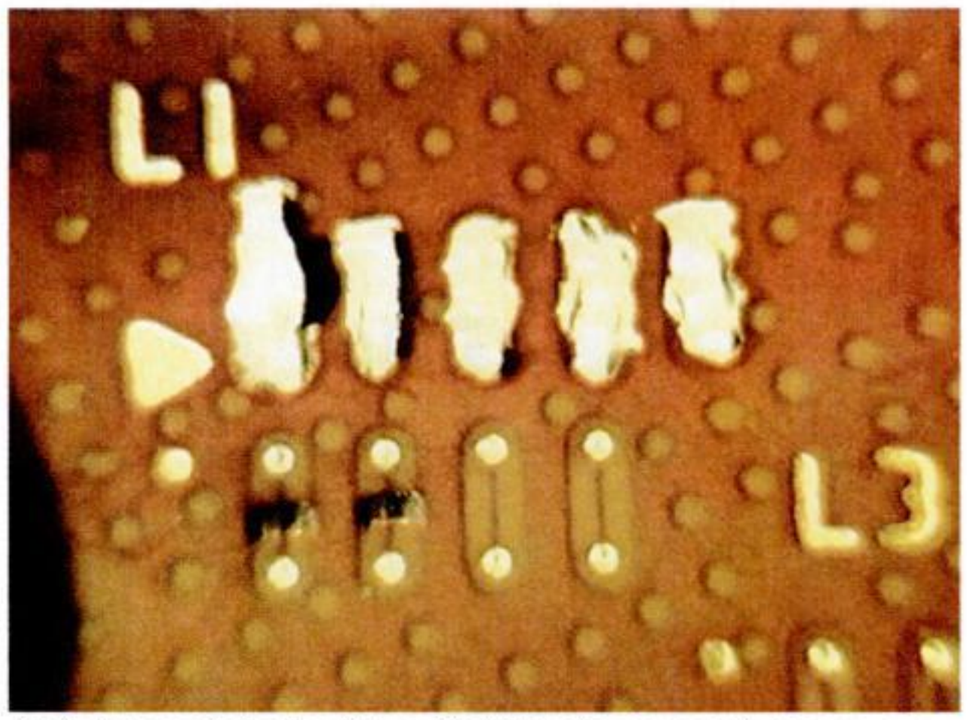
Case Study 4

■ UNLOCKED ATHLON XP TO 338MHZ ON ASUS A7V333

We actually performed the following overclocking for our September 2002 "Lean Machine" story. This budget box started with a 1.67GHz Athlon XP, but ended with much more. Pointedly ignoring AMD's official FSB speed limit of 266MHz, the Lean Machine's FSB blasts through enemy defenses at 336MHz (168MHz double-pumped). This feat was facilitated by the system's rock-solid Asus A7V333 motherboard. Even at this sky-high FSB frequency, problematic PCI card behavior wasn't an issue, as the A7V333's PCI bus speed resets to 33MHz at a 166MHz FSB. We unlocked the Lean Machine's Athlon XP 2000+ processor with a $12 kit, and reduced the multiplier from 12.5 to 10.5 for a final CPU speed of 1.76GHz. All overclocking was done through the A7V333's BIOS, including a minor voltage boost to ensure stability. The Lean Machine's relatively painless overclocking job paid off in our benchmarks: *SYSmark2002* hit 203, up from just 182, while the *Premiere* score of 362 seconds set a new record. The most amazing thing? All this overclocking was done without any special cooling—the CPU fan cost just $7.



This image (shot with a digital microscope) shows our unlocked L1 bridge.

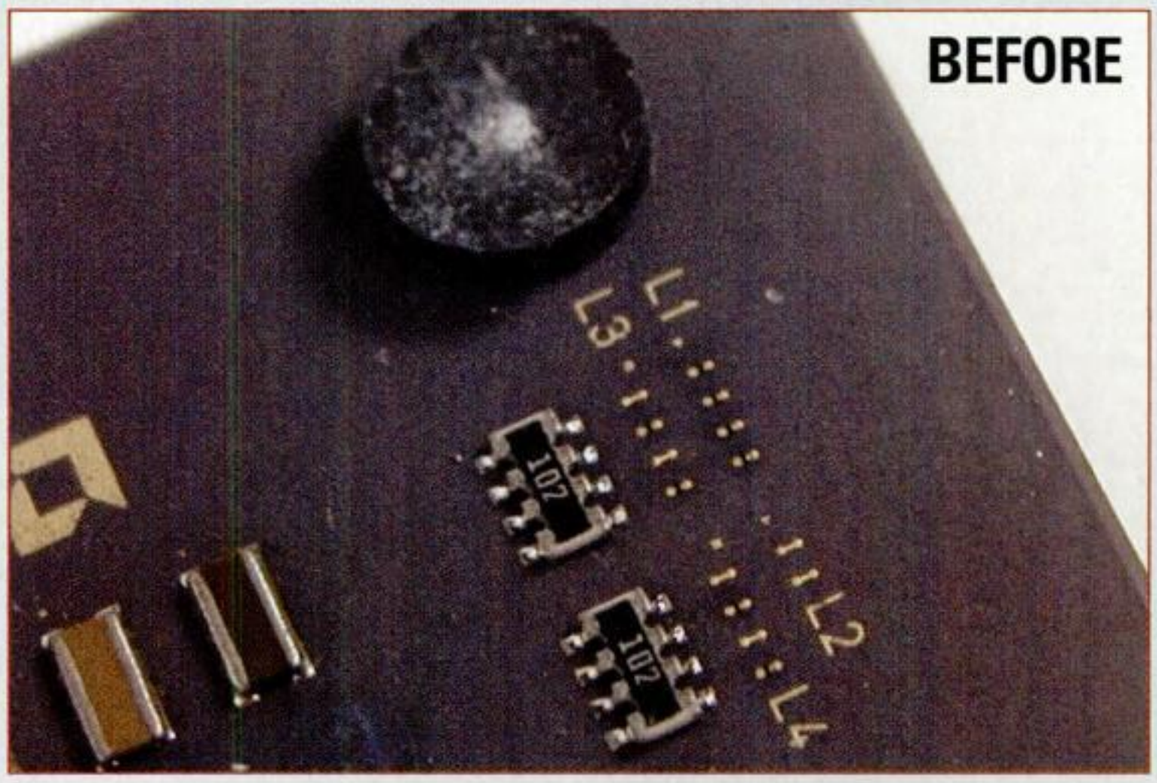
UNLOCKING ATHLON XPs

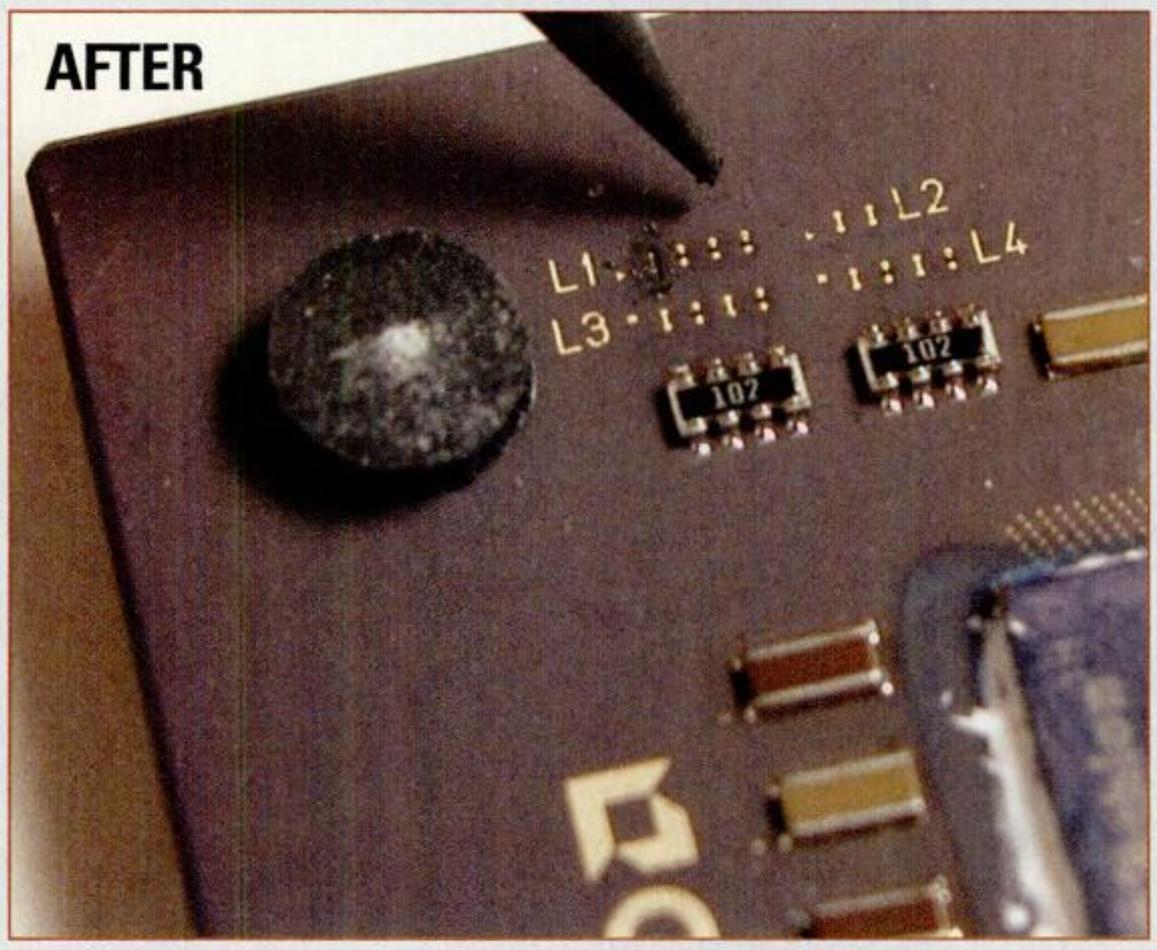
Speed freaks everywhere were crestfallen when AMD followed in Intel's footsteps by introducing multiplier locking in the Thunderbird Athlon. But, luckily, the very same speed freaks discovered that the T-bird could be unlocked using an ordinary pencil. Here's the deal: AMD locks Athlons by cutting the L1 bridges on the processor packaging, so connecting the L1 contacts with an appropriate substance removes the multiplier lock. Graphite works for the Thunderbird Athlon, but is too resistive for the Palominos and Thoroughbreds. So if you're really serious about multiplier unlocking, you can go to www.highspeedpc.com for a $12 unlocking kit. As the web site states, "This kit contains the tools necessary to unlock the full range of multipliers on the AMD XP line of processors."

But owners of the Athlon XP 2100+ must take special note: Due to changes in the processor packaging, an unlocking kit will usually not work on this CPU. Currently, the only known way to unlock the 2100+ involves a Dremel tool, so we suggest holding out until better methods emerge.

Now, for those of you who do have an old Thunderbird Athlon, here's a quick description of the "pencil trick." It might be crude, but it can unlock your CPU's multiplier. All you'll need is a sharpened number-two pencil and a Socket A Thunderbird. First, remember to handle your CPU carefully, taking all standard precautions against electrostatic discharge. Now, in one corner of the processor packaging are four sets of copper traces; locate the set labeled "L1." Look through a magnifying glass and you'll see a tiny gap between the two halves of each L1 bridge. Grab your pencil and carefully fill in each of the four gaps. If you make a mistake, use an eraser as your undo button.

Once the L1 bridges are connected, remove any residual thermal compound from the processor and heatsink, and apply a fresh coat. Now, hook everything back up and try changing the clock multiplier in your BIOS—that's all there is to it! Just one known caveat: Over time, the pencil lead will eventually lose its effectiveness, after which you'll need to reapply it. For a more permanent fix, ditch the pencil for some rear window defroster repair solution from your local automotive shop. ■





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How To...

PICK THE BEST COOLING DEVICE

We put 12 case coolers, CPU coolers, bay coolers, and slot coolers to the test

BY JOHNATHAN D. MCKINNEY

The Zalman "blooming flower" may not be the best heatsink, but it's certainly the classiest.

Fast PCs generate fun, excitement, and blazing 3D performance. They can also generate excessive heat. In the next five pages, we'll show you how to cool damn near every high-risk component you own, and give you the lowdown on some of the most popular cooling products around. Even if you're not an overclocker, cooling your system can improve the longevity of your parts and, in some cases, help you avoid the Blue Screen of Death.

Testing for this article yielded a few surprises and breakthrough performers—stars were born, dreams were shattered, and we even came close to frying a couple videocards. We also discovered how difficult it can be to develop standardized testing methods. Case, CPU, drive bay, and slot coolers all have their own physical idiosyncrasies, and thus demand different strategies for recording relative temperature changes. Regardless, testing for each product category shared a similar strategy.

First, we established a basic test bed—a 2GHz Pentium 4 overclocked to 2.3GHz, a Radeon 8500 videocard, and an 80GB Maxtor D740X-6L hard drive, all installed in an InWin IW-S508 steel case. We then ran the system through 30 minutes of intensive number-crunching and recorded baseline temps for each subsystem. To measure ambient case temperatures (which are relevant to 80mm case fans), we used thermal sensors from Oregon Scientific and Antec. To record hard drive and videocard temperatures, we used a Raytek Minitemp thermometer "heat gun." To record CPU temperature tests, we used the internal sensor of our Asus P4T motherboard. All temperature readings mentioned in this article are in Fahrenheit.

Finally, with baseline temps in hand, we proceeded to test the subjects of this article. One by one, we installed each cooling product, put it under a half-hour's worth of computing pressure, then recorded relevant temperatures. Cooling performance was our number one review consideration, but we also considered ease of installation, visual pizzazz, sound levels, and price. After all, what good is a kick-ass fan if it costs an arm and a leg and wakes the whole neighborhood?

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Case Fans

Overlooked and underappreciated, the case fan toils, day in and day out, working to move as much hot air out of your case as possible—all without so much as a "great job, buddy." Nonetheless, we'd all be up to our ears in blue screens if we didn't have proper system-wide case cooling. Simply put, it's the hardcore PC enthusiast's first line of defense.

Because there are so many different case fans available, choosing one can be daunting, especially when there's no real way for a user to do comparative testing on his own custom-built machine (barring the purchase of expensive thermal equipment). In fact, most of you probably still have the same case fan that came with your case, and are wondering if there's something better out there. In this section we'll look at the performance, loudness, and beauty of three 80mm fans. To conduct performance tests, we used two heat sensors: One near the front of our case, and another near the back, close to our CPU and expansion cards. Our InWin case came with a single stock 80mm Delta fan located in the rear. To establish the base cooling properties of this fan under a heavy workload, we ran *CPU Burn-in* and *3DMark2001 SE* simultaneously. Under this number-crunching pressure, the Delta yielded 78 degrees in the front of the case, and 92 degrees in the back. (Your temps may vary at home; these numbers should only be used to compare the performance of competing fans in the exact same test rig.)

OK, we've got the base temperatures, and we've got the heat. Now let's get to the benchmarks...

Vantec Stealth SF8025L

Let's be frank about the Vantec Stealth: It moved less air out of our case than all the other 80mm fans in the roundup. And while it's specifically marketed as a quiet fan, it wasn't nearly as quiet as we expected. It's also more expensive than a generic fan, and bears no visual appeal whatsoever. Under a heavy workload, the inside of our Stealth-equipped case hit 85 degrees in the front and 93 degrees in the back. That's not much worse than the other fans on this page, but why settle for any performance drop at all if the Stealth can't also provide remarkable quietness? When push came to shove, we could barely tell the difference in the noise level of the Stealth and the stock Delta.

Now, if we were to invest in the Stealth game plan, we think a total of four would be ideal: a fan over the CPU (probably mounted on top of an Alpha heatsink), a fan blowing air from the front, and two exhaust fans. Such a heavy Stealth payload would be quieter than a similar config based on competing fans, and the cooling would be sufficient for overclocking shenanigans. Vantec more or less gave us what they promised: a relatively quiet fan. It's just a good thing the company didn't promise great performance.

MAXIMUM PC VERDICT: 6

$11, www.vantecusa.com

Vantec Tornado TD8038H

With a name like "Tornado," this sucker better be ready to push a whirlwind of overclocking goodness. In fact, Vantec says this beast moves 84 cubic feet of air per minute (the Stealth is rated at 27 CFM, and the Trilight reviewed next is rated at 34 CFM). A CFM spec of 84 is audacious, and we bet the AC in your Honda Civic doesn't move that much air. But, as always, performance comes at a price.

In order to completely upend the microclimate of every host case it enters, the Tornado spins at a whopping 5700rpm. The Stealth hits just 2050rpm. As one might expect, the Tornado is considerably louder—exponentially louder, according to Vantec's own estimations (the Tornado is spec'd at 55dBA to the Stealth's 21dBA).

The back of the case was a staggeringly low 84 degrees—the lowest rear temperature in this roundup by 8 degrees. The front hit 77 degrees. We can't argue with the numbers: The Tornado yielded more cooling than any other case fan we've ever encountered. If you want to stuff your rig to the brim with shoulder-to-shoulder components, you've found your boy. Just don't be surprised if your friends start calling your PC "The Aircraft Carrier," because even just a single Tornado sounds like a squadron of F-16s.

MAXIMUM PC VERDICT: 8

$18, www.vantecusa.com

Antec Trilight

Have you ever stared into one of those cases with a transparent window and wished the interior had a dazzling array of color and light? And wouldn't it be even better if those lights were mounted on a fan, so they provided beauty *and* practicality? With everyone installing newfangled case windows these days, the appearance of case interiors is becoming more important. The good people at Antec realized this and designed a fan for all the mod-crazy kids. The Trilight isn't much to look at when it's powered down, but once you get that thing installed and dim your room lights, the fan provides a virtual Laserium show right inside your case!

Compared with the stock Delta fan, the Trilight's performance wasn't as dazzling as its appearance. At 95 degrees, the fan trailed all other competitors in the roundup when it came to back-of-case cooling—not good, considering that overclocked videocards and CPUs reside in the backs of cases. The front of the case, meanwhile, hit an uneventful 78 degrees.

With its splashes of red, green, and blue radiance, the Antec Trilight enchanted us. Performance was slightly below average, so it probably isn't a good pick for hardcore overclockers unless the fan is complemented by colder blowers located elsewhere.

MAXIMUM PC VERDICT: 7

$14, www.antec-inc.com

Copyrighted material

Pentium 4 Coolers

The chances are strong that if you've bought a CPU in the last six months, its name starts with a "P" and ends with a "4." Hence the public's keen interest in Pentium 4 upgrade products—people want to know if aftermarket coolers offer any tangible benefits over the stock cooling that comes with a boxed processor. To resolve the matter once and for all, we decided to compare two third-party P4 coolers to the cooler that's bundled in with all Pentium 4 retail boxes.

There are two things required to test CPU coolers: First, a program or gadget that can record a processor's temperature, and, second, an application that will force the processor into a feverish sweat. To fulfill the first requirement, we grabbed *Motherboard Monitor 5*, a Windows application that reports temperature readings pulled directly from a CPU's mobo (assuming the board supports this feature). To put our P4 under extreme duress, we grabbed a tiny program called *CPU Burn-in*, which is surprisingly demanding considering its tiny 25K size. We ran this program for more than 30 minutes on all three coolers. Our initial runs had the processor performing at a stock 2GHz. We then repeated the tests with the P4 OC'd to 2.3GHz.

So which cooler was most efficient at stopping the heat wave? Read on...

Stock Heatsink-Cooler

It may not be much to look at, but Intel's stock cooler performed reasonably well. This is a bit surprising because we thought the mousy heatsink would leave us sorely disappointed. The last thing Intel wants is a bunch of power-hungry idiots overclocking their processors, so it might stand to reason that the company would bundle a "just-good-enough" cooling kit, if only to discourage tomfoolery. But, who knows, maybe Intel was just paying very close attention to its own liberal heat tolerances, and concluded that it doesn't need to offer arctic-caliber cooling.

The fan on Intel's puppy spins at about 2900rpm, and is fairly quiet. Installation of the cooling apparatus was uneventful enough, except for the manipulation of the two clips that lock the whole thing into place. Pushing them down sounded like nails on a chalkboard, and more then once we wondered if we were breaking something.

Regardless, clocked at 2GHz and running at idle, the CPU temperature was 82 degrees. More than 30 minutes later, we had finished putting the P4 through *CPU Burn-in's* death march, and recorded a CPU temp of 102 degrees. That was sizzling, but then we decided to get all Emeril on the chip and "kick it up a notch." At this point, running at 2.3GHz, the P4 rose just 5 degrees, bringing the grand total to 107. We were expecting a large increase in heat when we jumped to 2.3GHz, but the stock cooler pleasantly surprised us.

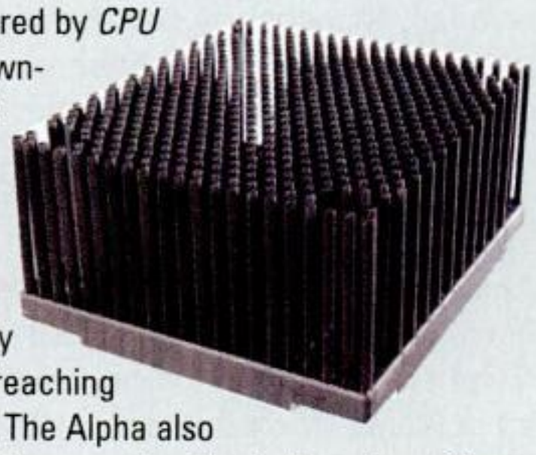
MAXIMUM PC VERDICT: 8

"Free" (bundled with retail CPUs), www.intel.com

Alpha PAL 8942T

This intimidating heatsink is constructed of black anodized aluminum and features a copper base. If you order direct from Alpha, the 8942T ships with two 80mm fans. The first is a "high performance" Delta fan, which we used for testing. The second is a quieter fan made by Sanyo Denki.

While the CPU was being hammered by *CPU Burn-in* at 2GHz, the Alpha kept it downright chilly at 93 degrees—9 degrees cooler than stock cooling. When we stepped it up to 2.3GHz for another half-hour-plus of CPU hell, the temperature topped out at 96 degrees. This established the Alpha as the only cooler that could keep the P4 from breaching 100 degrees under maximum duress. The Alpha also boasts a near-universal design that allows you to attach almost any 80mm fan (make no mistake: Fans are required).



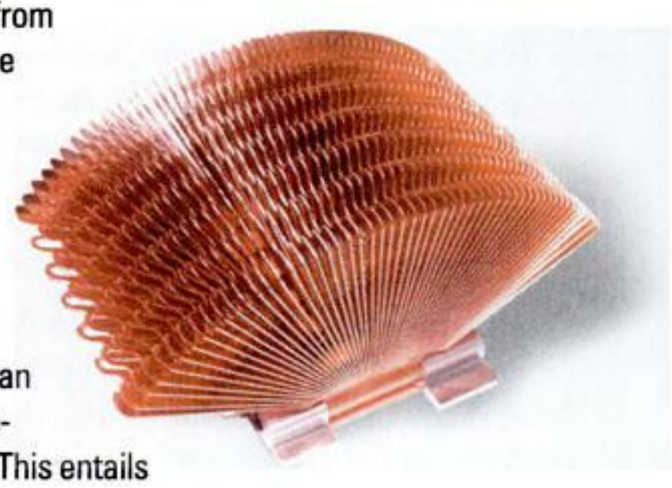
To test the versatility of the Alpha, we stuck the Vantec Tornado case fan on the heatsink. With the P4 clocked at 2.3GHz and carrying a full load, the core didn't even reach 90 degrees! That said, the Alpha was the most time-consuming P4 cooler to install. It requires 12 screws to fully assemble, and you have to remove your motherboard (and probably most of your components). Alpha's instruction manual recommends that you install the fan so that it's sucking air away from the heatsink, as opposed to blowing air onto it. However, in our testing we found that if you defy Alpha's recommendations, you get better cooling. The Alpha's superior performance as well as its compatibility with most 80mm fans make it one of the best.

MAXIMUM PC VERDICT: 9

Price: $35 (not including bundled fans), www.micforg.co.jp

Zalman CNPS6500B-CU

With its pure copper heat dissipaters arranged in a "blooming flower" design, the Zalman is not only the most exotic-looking cooler in the roundup, but also the only CPU cooler targeted at people who want to limit noise. The kit comes with an adjustable fan that can drop from 2500rpm to 1600rpm when you choose "silent" mode



Mounting the heatsink was a piece of cake—two big plastic clips snapped onto the P4's stock mounting brackets with ease. Mounting the fan was more difficult: The heatsink design doesn't allow a fan to sit directly on top, so it must be suspended just above the flower petals. This entails attaching the fan's mounting arm right over your expansion cards, which is a real pain if you constantly swap out PCI devices.

Under number-crunching duress at 2GHz, the CPU reached a torrid 107 degrees. When we cranked it up to 2.3GHz, the Zalman allowed the CPU to reach a blistering 113 degrees. That's 7 degrees more than the stock cooler. In Zalman's defense, a representative said that the flower heatsink was designed for quiet computing, not overclocking madness. We didn't have a verifiably accurate device for measuring decibel levels, so we had to, uh, just "play it by ear." By simply listening to the fans, we didn't notice a big difference, if any, in noise levels between the stock fan and Zalman. The upshot is we can't see any reason to upgrade to the Zalman, unless you have an open case and want to show off one of the coolest-looking heatsinks in existence.

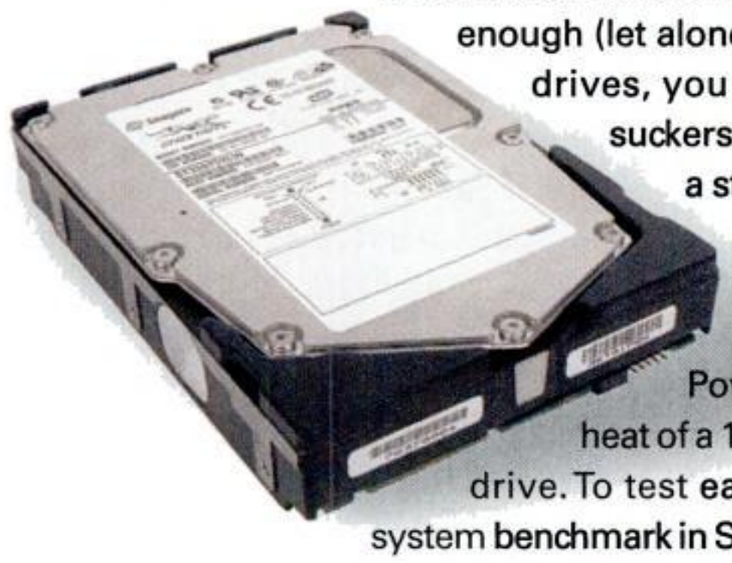
MAXIMUM PC VERDICT: 6

$50, www.zalman.co.kr/english/intro.htm

Copyrighted material

Hard Drive Coolers

Aside from a defrag every now and then, do you really need to concern yourself with hard drive health? You do if you want to protect that 5,000-song MP3 collection. And now that hard drives are capable of moving up to 160GB of data and spinning at a staggering 15,000rpm, it's about time you start seriously thinking about cooling. Hard drives are built from mechanical, moving parts, and just like car engines they break down if allowed to run too hot. And if you're fortunate enough (let alone rich enough) to run SCSI drives, you already know that those suckers can get hot enough to sear a steak.



In this roundup, we pit hard drive coolers from GlobalWin, Antec, and PC Power & Cooling against the heat of a 10,000rpm Seagate Cheetah drive. To test each cooler, we ran the file system benchmark in SiSoft *Sandra* for a half-hour, then used a Raytek thermometer gun to take temperature readings from two locations. We first measured the temperature coming off the top of the drive, then grabbed a reading from one of the chips located on the bottom of the drive. Without a cooler, this lean, mean grilling machine hit 120 degrees on top and 139 degrees on the bottom. With our baseline temps established, we were ready to test the cream of the hard drive–cooling crop

PC Power & Cooling Bay Cool

The Bay Cool is your basic, working man's hard drive cooler. The solid construction and simplistic design make it ideal for entry-level computer hobbyists who want to "set it and forget it." Once you've installed your hard drive in the Bay Cool's mounting bracket, you just slide the assembly into an open 5.25-inch drive bay. Then you simply plug it into your power headers, and you're swinging to the low purr of two 40mm fans. The whirling duo whisks 6.5 CFM of air over the hard drive. A small air filter on the front of the assembly keeps harmful dust from clogging up the fans but still allows cool air to make its way into the interior of the case.

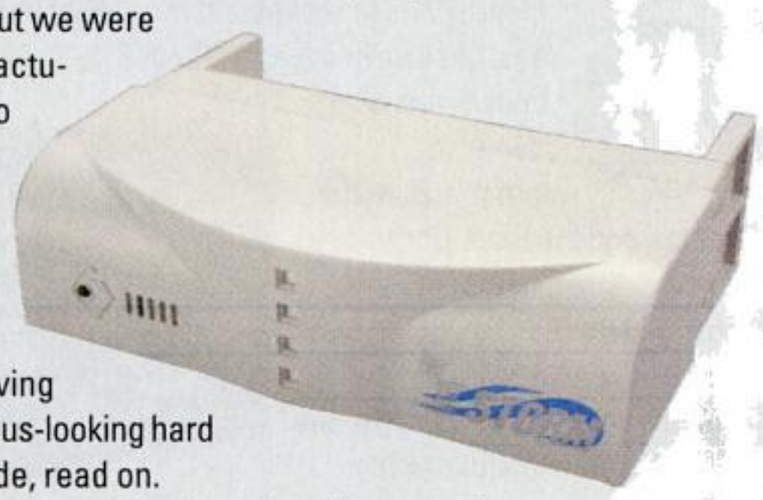
The two minis worked pretty well considering their size. While the SCSI drive was churning away on its meal of data bits, the Bay Cool dropped the top of the drive from 120 to 95 degrees. And while it appeared that the fans blew most of their air over the top of the drive, the chip underneath was cooled from 139 to 113. We were amazed that two dinky fans could make that much of a difference. The Bay Cool may not possess any of the extra features that other hard drive coolers offer, but its simple design and great performance make it a worthwhile investment for anyone who's serious about hard drive cooling.

MAXIMUM PC VERDICT: 8

$40, www.pcpowerandcooling.com

GlobalWin I-Storm II

The I-Storm II is a unique hard drive cooler in more ways than one. The first thing we noticed was that it looked a little too porky to fit all the way inside a 5.5-inch bay. Turns out we were right. The ugly cooler actually extended about two inches beyond the front of what had previously been a stylish case. Are we scaring you? Well, if you don't mind being ridiculed for having one of the most ridiculous-looking hard drive coolers ever made, read on.



Affectionately nicknamed "Elephant Nose" by our editors, the I-Storm II actually yielded decent performance. Even more amazing, it cooled our SCSI drive without all the noise of its competitors. The cooler's distinctive fan uses a single ball-bearing, rotary-style assembly to push a rated 35 CFM of air, all at low rotation. This engineering adds up to less noise. In fact, the only noise you'll hear is from the built-in alarm, which sounds if the I-Storm senses a problem.

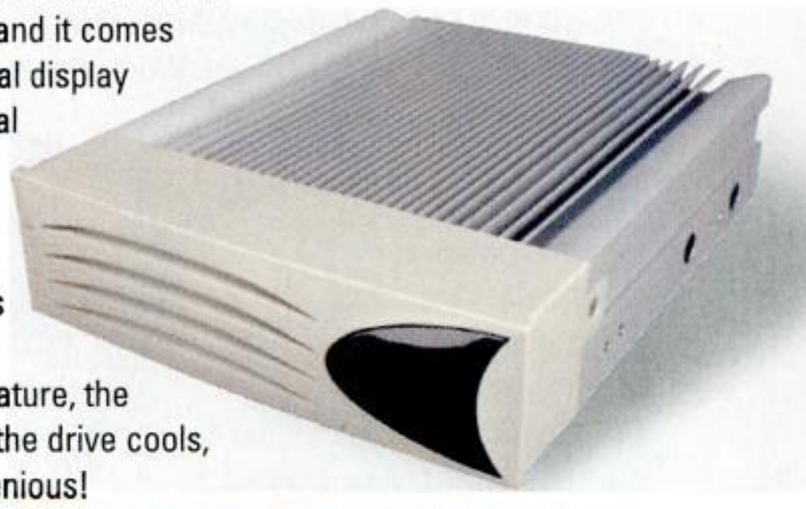
So it looks stupid and runs silent. But what about job one—cooling the damn hard drive? The I-Storm got the temperature of the top of the drive down to 96 degrees. The bottom, meanwhile, hit 121 degrees. Aside from its goofy design, the I-Storm is a nice buy. It offers good cooling without all the eardrum punishment. Just be prepared to ruin the beauty of your case.

MAXIMUM PC VERDICT: 7

$30, www.globalwinusa.com

Antec Hard Drive Cooling System

When *Maximum PC* first heard of Antec, the company was making its mark with well-designed PC cases. Flash forward a few years, and now we're reviewing an Antec hard drive cooler. At first glance, we could tell this thing meant business. It's the only drive cooler in the roundup to feature a heatsink, and it comes with a digital readout. The digital display is connected to a pair of thermal sensors. The first sensor monitors ambient case temperature, while the second monitors the hard drive and controls the drive cooler's fans. If your drive reaches a critical temperature, the fans kick in to high gear. Once the drive cools, the fans slow down again. Ingenious!



The Cooling System's stylish front panel pops off to reveal fans similar to the ones used in the PC Power & Cooling Bay Cool. The Bay Cool's fans are positioned farther apart than the Antec's fans, and one would think this would promote better cooling across the entire hard drive—but this wasn't necessarily the case. With the Antec, the bottom of the drive was cooled to 119 degrees after a half-hour of duress. That's a 20 degree drop. We couldn't get a direct reading off of the top surface of the drive because of the heatsink. But it's worth noting that the temperature of the heatsink was a "chilly" 95 degrees, which is probably a few degrees cooler than the drive itself. The Antec has style, features, and cooling. With its slick design and thermal sensor display, it's a total package.

MAXIMUM PC VERDICT: 9

$30, www.antec-inc.com

Copyrighted material

Slot Coolers

Many PC enthusiasts doubt the effectiveness of slot-based coolers for add-in cards. Some claim that these devices don't move enough air because their fans are too small. Others say the coolers' basic design is flawed; that they just move hot air over even hotter components. Well, enough bellyaching. It's time to enter the Lab and debunk these weak-hinged arguments. In this segment, you'll met three types of coolers, each working in different ways to achieve the same objective—to get your components to "simah down now!"

The Vantec is an exhaust fan. Its goal is to flush hot air out of your case, and away from hot components. The Buss-Cool from PC Power & Cooling sits in the PCI slot closest to your videocard and blows cool air directly onto one side of it (the rest of your case fans then take care of the heat exhaust). Finally, the Card Cooler from TheCardCooler.com mounts at a 90 degree angle over your videocard, and blows air over both the top and bottom.

Unless you're downloading MP3s 24/7 and your modem is overheating, most people will use these products to cool videocards. Because of its massive heat production, we decided to use an ATI Radeon 8500 for testing. In order to generate near-meltdown temperatures, we ran *3DMark2001*—specifically, the Nature demo at 1280x1024, 4x AA, and 32-bit textures, looping without pause for a half-hour. This is sort of like the videocard version of the Navy Seals' "hell weak." To record baseline temperatures, we aimed a Raytek thermometer gun on the card's core (the bottom of the card), heatsink (the top of the card), and RAM. Under extreme duress, these three components hit 141, 119, and 142 degrees, respectively.

Vantec Exhaust PCSC-100

The Vantec Exhaust's simple design and solid construction make it a good value for anyone looking to simply move air away from components. But while it lagged behind the other two coolers as far as performance, it was nearly silent in comparison, in large part due to its single brushless fan. During our stress test, it dropped the core down to just 137 degrees and the heatsink to 115 degrees. In both cases, that's only a 4 degree difference from no cooling at all. The Vantec did have more success cooling the RAM—it dropped 12 degrees.

We weren't expecting much from the Vantec, and that's exactly what we got; the fan just doesn't have enough cooling prowess to keep videocard overclockers feeling safe and secure. You see, in order to offer the most effective cooling, a fan must blow air directly onto a videocard, instead of just pulling air away from it. That said, while exhaust-type coolers aren't very popular with overclockers, OEM system builders are beginning to see their advantages. Take, for example, the PCFX Xbrat system, which *Maximum PC* reviewed in August 2002. It was one of the smallest systems we've ever reviewed, and all of its components were packed in tight together. Due to the small size of the case, there wasn't much room for a large exhaust fan, so PCFX installed one of these exhaust coolers, placing it in the heart of where the PCI cards reside. This is an ideal application for a cooler like the Vantec Exhaust—inside a small case, where *any* extra cooling is helpful.

MAXIMUM PC VERDICT: 7

$13, www.vantecusa.com

PC Power & Cooling Buss-Cool

Since 1985, the folks over at PC Power & Cooling have been coming up with unusual and innovative components. The Buss-Cool is no different. Its two superthin fans are spec'd to rush 26 CFM of air onto the card sitting adjacent to it. Out of all the components we tested, this one was the easiest to install. Forget about messy fan wires; the two fans simply draw power directly from the PCI bus. Worried about the electrical stress on your motherboard? Don't be. The device demands a mere 3.2 watts of power; less than most high-end videocards.

When we fired up *3DMark2001*, we noticed that the fans were quieter than we expected, but still noticeably noisier than the Vantec Exhaust cooler. The Buss-Cool's performance, however, makes up for the added noise. Although the heatsink didn't get much cooler (it dropped 5 degrees to 114), the core dropped 8 degrees, hitting a low of 131. Considering the size of the fans, we were also surprised so see that the Buss-Cool chilled the RAM to 117 degrees—that's a 25 degree difference!

The Buss-Cool offers solid performance without creating too much noise, and its installation couldn't be simpler. And considering that it draws power directly from a PCI slot, it doesn't add any wiring jumble to your case interior. The Buss-Cool may not be the highest-performing slot cooler available, but with all of its nice features, it's definitely worth considering.

MAXIMUM PC VERDICT: 9

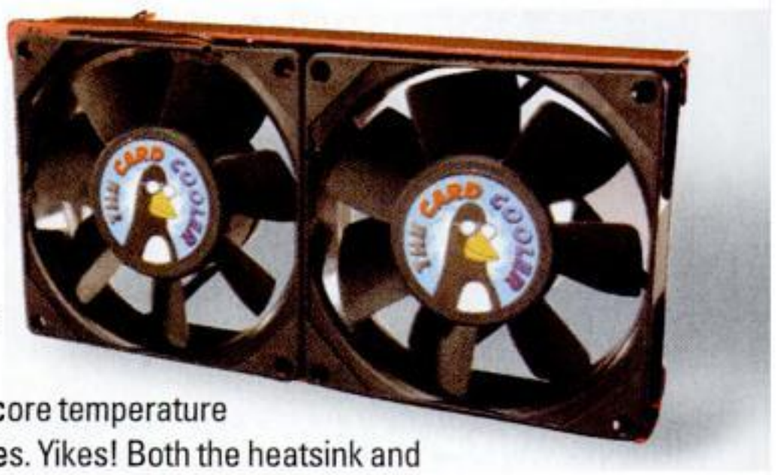
$29, www.pcpowerandcooling.com

Card Cooler featuring Sunon Fans

With two huge fans whooshing about 70 CFM of air above and below the videocard, we expected big things from the Card Cooler. And it did not disappoint us.

MAXIMUM PC KICK ASS PRODUCT

The device's massive airflow comes from two 80mm Sunon fans, each spinning at 2800rpm. The Card Cooler also benefits from its unique mounting approach. Both the Vantec and the Buss-Cool move air on only one side of the card, but when properly mounted perpendicular to a videocard, the Sunons will cool both sides of the card. The benchmarks pretty much speak for themselves. The core temperature plummeted from 141 to 111 degrees. Yikes! Both the heatsink and RAM dropped to 97 degrees—that's a 44 degree drop in RAM temperature!



With performance like this, who wouldn't want the Card Cooler? How about gamers who are trying to enjoy a late-night fragging session without waking their girlfriends, or their parents, or their girlfriends' parents. Adding the Card Cooler is essentially like putting in two additional case fans. Since these fans are installed on two metal brackets that use PCI mounting screws, the Card Cooler is also a bitch to install. And any time you want to swap out or move an expansion card, you'll have to fiddle around with the Card Cooler, which usually means placing the case on its side.

Still, if you can handle the significant noise this thing puts out, it's definitely worth the purchase price.

MAXIMUM PC VERDICT: 9

$20, www.thecardcooler.com

Copyrighted material

ADVENTURES IN OVERCLOCKING

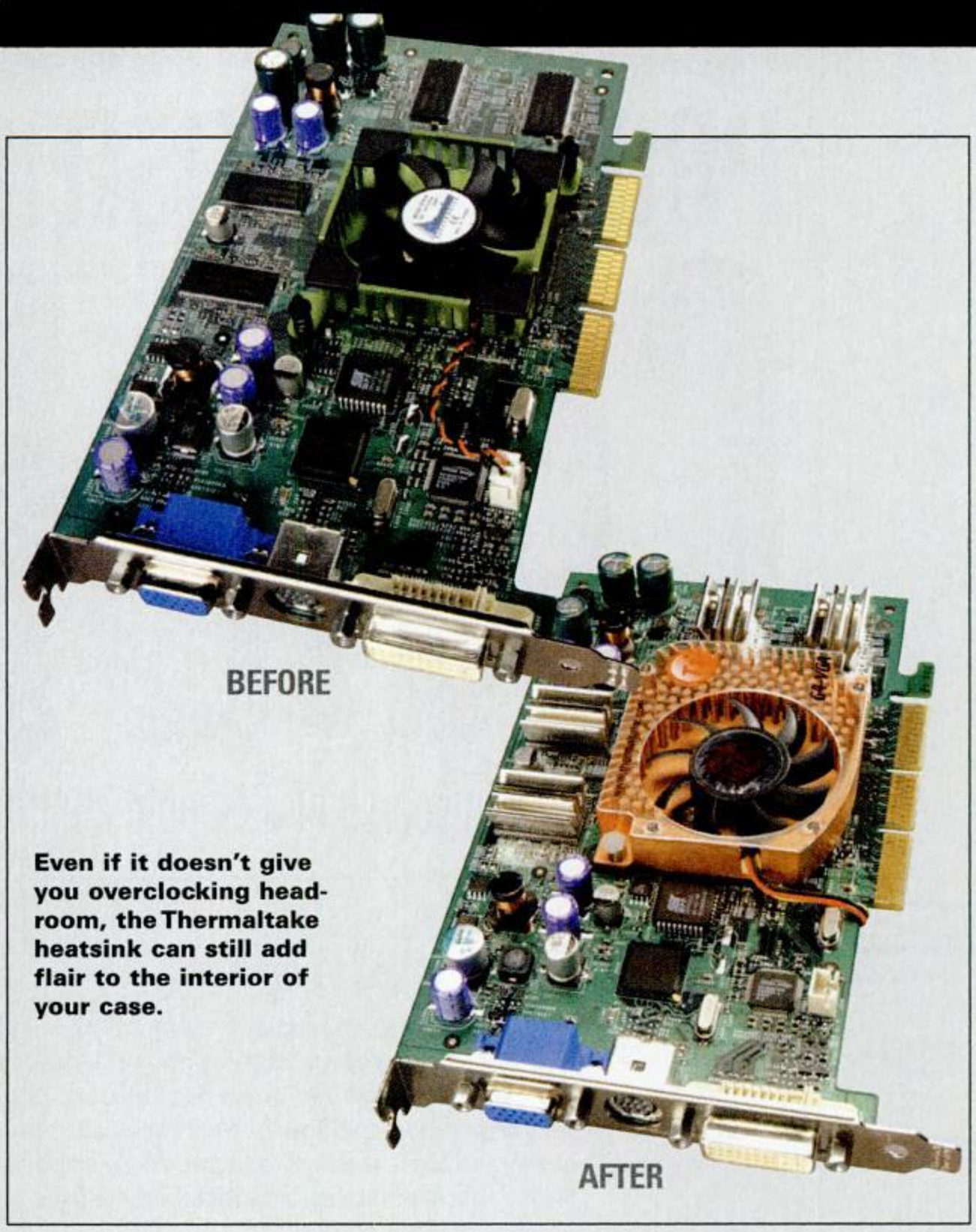
JUST HOW FAR CAN YOU PUSH A TI 4200?

If nVidia's fancy stock GeForce4 cooler is special enough to warrant its own patent, then why do third-party companies even bother selling aftermarket videocard coolers? Because stock parts are never enough in the exotic world of extreme overclocking. Or so it might seem. To get to the bottom of the "stock vs. aftermarket" debate, we decided to push a Geforce4Ti 4200 to the limits of stability. Could aThermaltake GeForce 4 Highest Performance cooler and memory heatsinks fromTweakMonster.com give us more OC headroom than the stock nVidia cooler? We decided to find out.

To determine how well the stock cooling worked, we overclocked our card's memory and core from 250MHz to 275MHz. After a half-hour of *3DMark2001*, thermometer gun readings gave us a core temperature of 154 degrees and a memory temperature of 126. At this clock speed, the card ran stable with no artifacting or visual defects of any kind. The big question, of course, was how high could we clock the damn thing? Well, the core wouldn't go past 285MHz without crashing, and we couldn't get the memory past 295MHz without major video fuzz. But this was with the stock cooling. The real question was, Would the aftermarket cooling give us a boost?

After affixing the "RAMsinks" andThermaltake's cooling kit, we sent theTi 4200 back into the hot zone. Again, we OC'd the core and memory to 275MHz each and put the card through another 30 minutes of testing. The copper cooler did its job, keeping the core from going over 140 degrees, a 14 degree drop from stock. The RAMsinks, meanwhile, didn't work as well as we had hoped. The memory still got up to 123 degrees, which is just three degrees cooler than what we experienced with no heatsinks at all. Even worse, we weren't able to push the card much further. The core refused to go past 288MHz and the ram clocked out at 300MHz. It's quite possible that our specific videocard just happened to lack headroom, and your results may differ. But it's even more likely that nVidia did its homework and created a stock cooler that's ready, willing, and able to complete most overclocking assignments.

The moral of the story? Buying expensive cooling in order to get the most from your videocard may not be necessary. ■



Even if it doesn't give you overclocking headroom, the Thermaltake heatsink can still add flair to the interior of your case.

■ **Thermaltake GeForce 4 Highest Performance cooler**

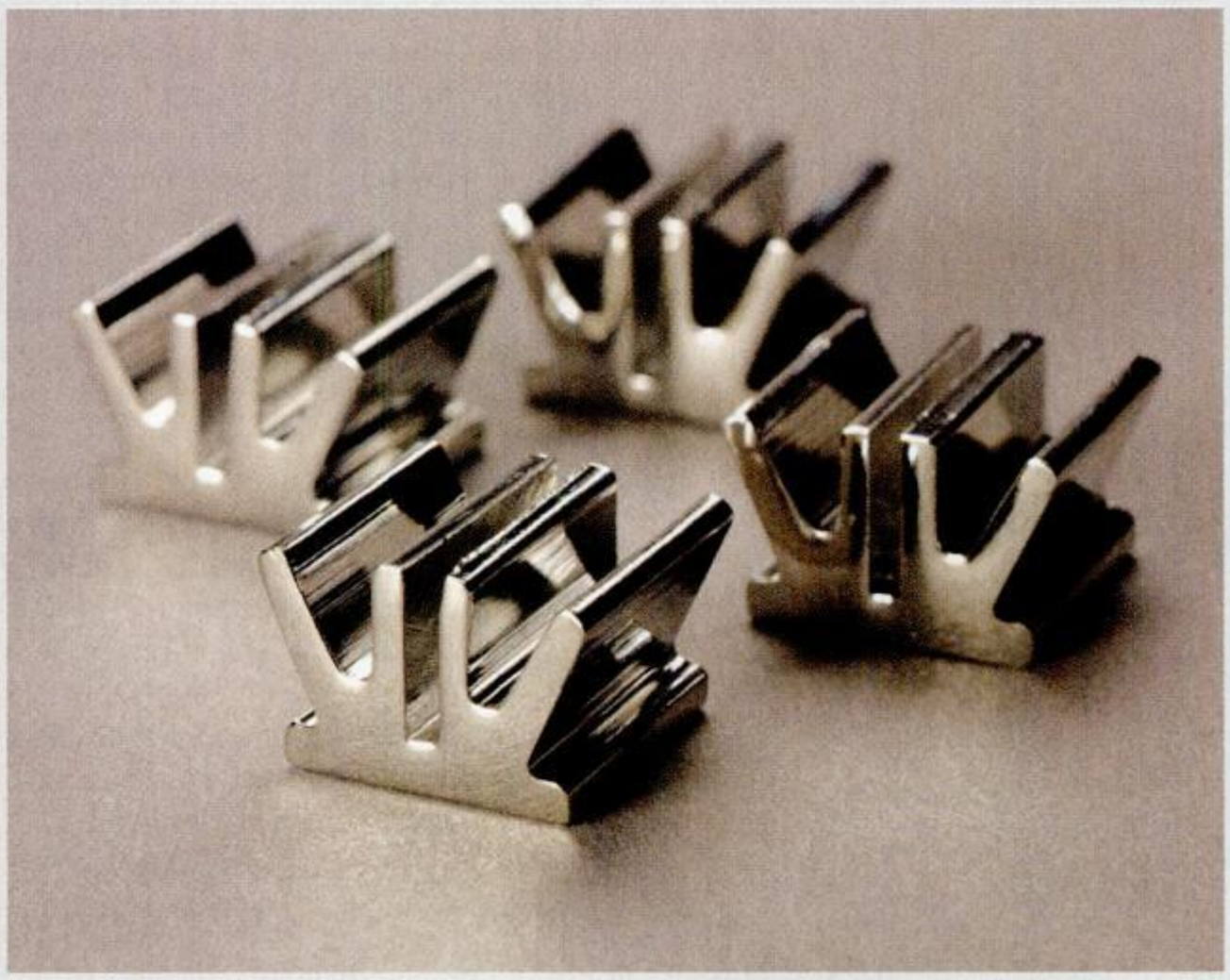
MAXIMUM PC VERDICT: 8

$18, www.thermaltake.com

■ **TweakMonster RAMsinks**

MAXIMUM PC VERDICT: 6

$18, www.tweakmonster.com



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How To...

PROPERLY POSITION YOUR CASE FANS

We blow smoke in search of a climate-controlled case

BY WILL SMITH AND GORDON MAH UNG

MAXIMUMPC
DIFFICULTY RATING
EASY
HARD

With CPU speeds approaching 3GHz, hard drives hitting 15,000rpm, and videocards generating enough heat to deep-fry an Arkansas pickle, the flow of fresh, cool air through case interiors is becoming increasingly important. Heat causes instability, and instability causes Blue Screens of Unhappiness.

But how do you promote the best airflow possible? How do you know whether your fans should be sucking air in, or blowing air out? How do you determine if you should have a fan mounted on top? And what about drive-bay coolers? We decided to find out.

To help us determine the best fan placement spots, we pumped "movie fog" into two computer cases, and observed exactly how each rig's interior fans affected the flow of the smoke within. If the smoke wasn't properly whooshing past critical components, we knew we'd need to reevaluate fan placement. Our first case study focused on a home-built dual-Celeron rig. It was loaded with a bazillion fans and wrapped in a SuperMicro full-tower case. Our second case study involved a factory-built Dell rig featuring a 733MHz Pentium III. It came with a default two-fan config.

Here's what we gleaned from our airflow tests. Apply what we learned to your own case at home.

Getting Started

For our experiments, we bought a sheet of Plexiglas, a Plexiglas cutter, duct tape, five feet of flexible heater vent tubing, and a VEIV-925 smoke/fog machine made by Visual Effects. The VEIV-925 cost $125 at a Halloween store. The device works by vaporizing a "fog fluid" mixture into superfine particles.

First we cut sheets of Plexiglas to replace the case sides, and used the duct tape to seal leaks all around the edges of the Plexi. After some experimentation with different methods of introducing smoke into the systems, we found that we got the best results by feeding smoke into the cases via a heater hose. The hose was connected to the smoke machine on one end, and to a cardboard box on the other end. We then fitted the cardboard box over the PCs' front air intakes.

We filled each system with smoke to make airflow patterns visible. While we were able to clearly see distinct patterns emerge when we turned on the smoke-filled PCs, the photographs in this article don't illustrate the patterns very well, so we've added arrows to highlight our observations.

Anyone can conduct airflow tests at home. Just be aware that there's always risk associated with pumping any kind of vapor into an electrical device. Electric shock is certainly a consideration, and you can also destroy your delicate electronics. For this reason, you might want to eschew home-testing, and just use this article for general advice.

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Case Study 1:
SuperMicro SC-750A

To see how airflow works in a full-tower rig, we performed our first test on SuperMicro's SC-750A case. Twin 8cm fans were mounted in the front bezel, a 10cm fan sat above the power supply (complementing the existing power-supply fan), and three different fans served the motherboard's chipset and two CPUs. An 8cm case fan for blowing air onto the CPU, and a 4cm fan mounted on the back of the case (directly behind the CPU) were notably absent. We chose this elderly system because it was positively stuffed with peripherals, including three hard drives, two optical drives, four PCI cards, and a smoking-hot GeForce DDR videocard warming the AGP slot.

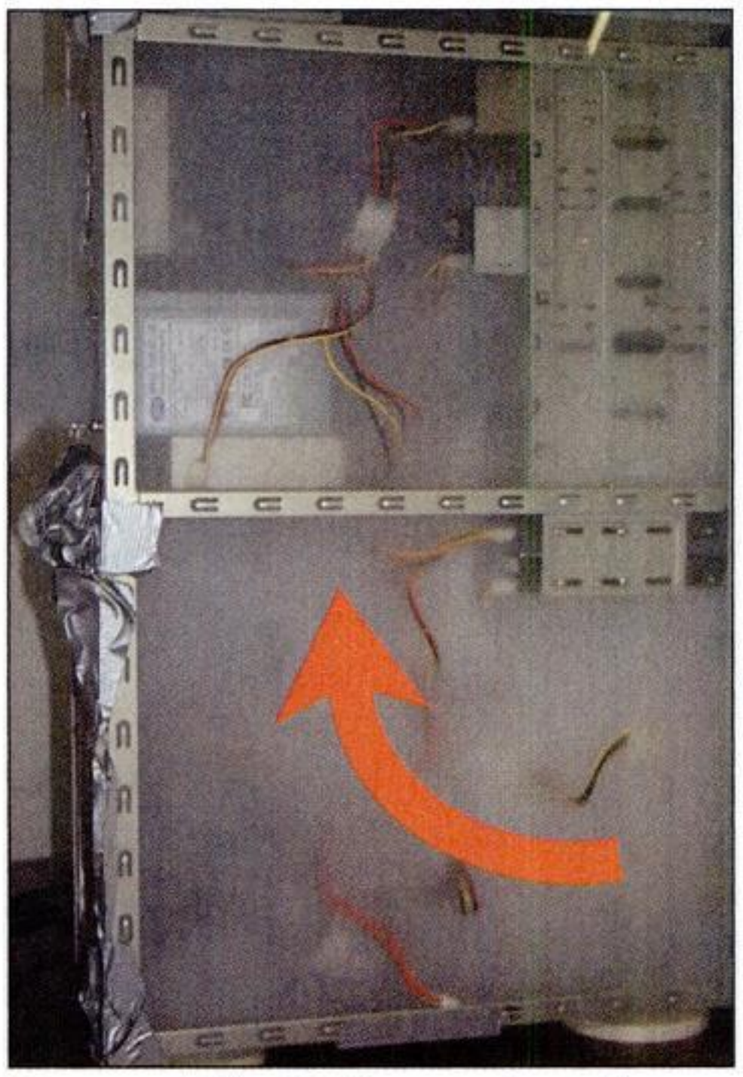
The first thing we noticed about the SC-750A was that the triple CPU/chipset fan combo created massive air disturbance. The fans threw up small funnels of smoke as they sucked air down onto their respective chips. This, of course, doesn't necessarily aid in cooling; such a system might simply blow hot air to other parts of the case. Also, in order for the smoke to exit, it had to flow from the front of the case, through the turbulent air above the CPUs, and into the power supply, where it was evacuated—a convoluted, inefficient course. Moral of the story: If you want to really cool your CPU and chipset area, you should install an exhaust fan behind the CPU, below the power supply. This will push hot air out of your case and into the room at large.

Our test also confirmed the need for the svelte cables that will be afforded by Serial ATA. Our 750A hid a veritable rat's nest of SCSI, IDE, and floppy ribbon cables that acted like a wind drogue, blocking the flow of air from the two front fans. Serial ATA's I/O cables, which are about 1/4-inch in diameter and more than twice as long as current IDE ribbon cables, will be a welcome change for PCs.

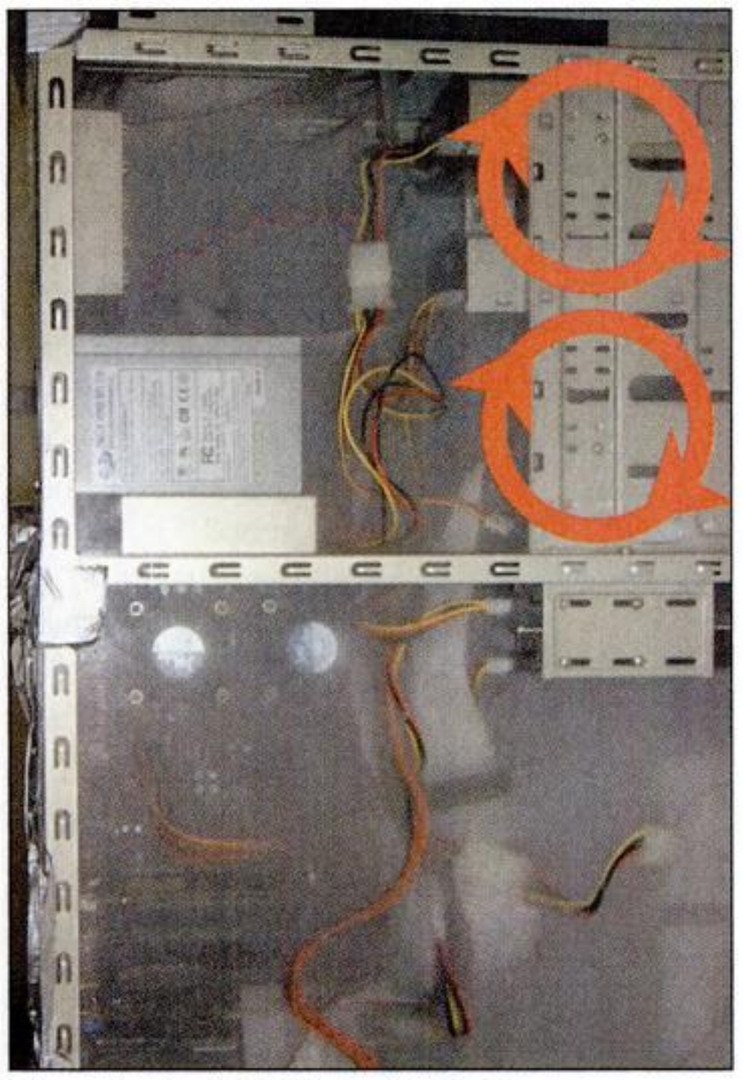
Another problem we encountered concerned dead air surrounding peripheral cards. Because the I/O cables prevented bezel fan air from blowing directly onto the PCI cards, air movement in the PCI card area was stilted at best. Although the SC-750A alleviates some of this by including passive vents near the PCI cards, we didn't find them adequate for cooling today's hot peripherals. So we added a PCI exhaust fan to better evacuate the air near the PCI slots.

The SC-750A was properly configured in respect to its placement of storage devices. The two optical drives were wisely mounted with plenty of room between them, encouraging airflow. If you have problems cooling drives, the 750A actually lets you mount fans on both sides of your drive bays. If your case has that option, we recommend installing the fans, particularly if you're running a lot of hot, high-speed drives.

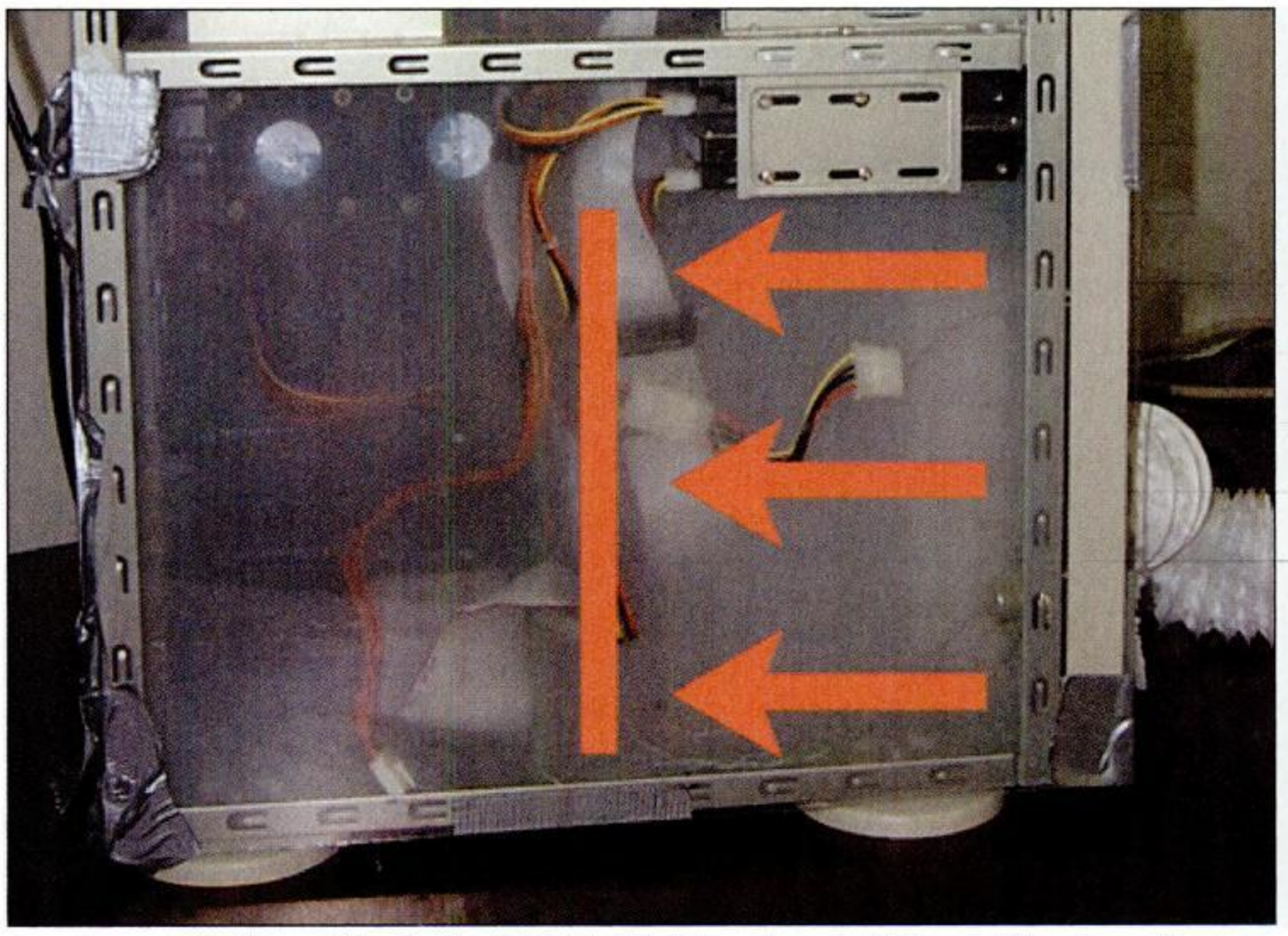
We didn't expect the auxiliary fan mounted above the power supply to do much good, because we thought the power supply fan would "steal" most of the air before it reached the top of the case. To test our theory, we ran the system both with and without the top fan enabled. Surprisingly, airflow was reduced considerably when the top fan was disabled, causing the air to bog down in the lower half of the case. When the top fan was on, air moved well from the lower intakes and over the drive bays before it was blasted out of the system. To see if we could mimic this action for those of you with mid-tower cases, we shut down the top fan and added PC Power and Cooling's Turbo Cool 2X, an additional fan that screws to the back of the power supply and is purported to increase the airflow through your system. The Turbo Cool's high-velocity fan made quite a difference in clearing the smoke, working almost as effectively as the auxiliary fan that lives above the power supply. Unfortunately, this fan also sounds like a DC-3.



Air entered the 750A's case along the arrow's path but was not sufficiently vented through the area around the power supply.



Though the 750A's optical drives are staggered for better airflow, they still could have benefited from the optional drive bay fans. In their current config, the drives suffer from dead air zones.



A rat's nest of drive cables in the 750A is blocking almost all the air flow from the two front bezel fans.

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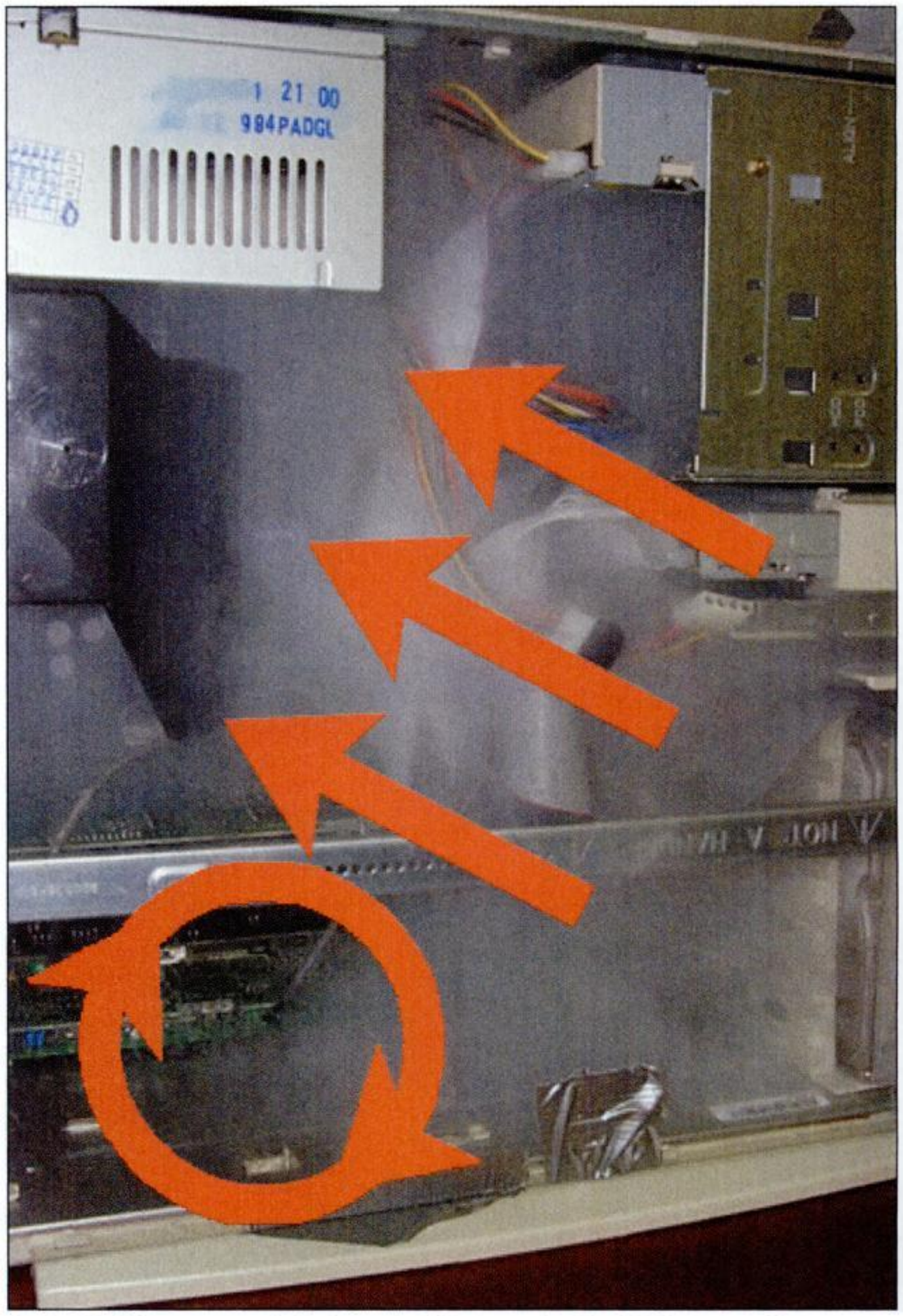
Case Study 2:
Dell XPS B733r

The second system we ran through the grinder was one of our old Dell test rigs. It used the standard "Palo Alto" case employed by Dell and a number of other OEMs, a 733MHz Pentium III, 128MB of RDRAM, and just two fans. The Palo Alto is designed for power users who don't need a ton of expansion capabilities. Like most OEMs using the Palo Alto case, Dell relied on a custom-fitted "wind tunnel" that reaches from the CPU to an 8cm fan mounted inside the back of the case. The wind-tunnel design has the advantage of directly venting air from the CPU rather than just moving it around inside the case. It also allows the use of larger fans that spin at lower RPMs—and thus produce lower decibel levels.

With only the wind-tunnel fan and the power supply fan aiding exhaust, how well does this system work when compared to a system with a zillion fans? It turns out that the wind tunnel performs much better than we expected. In the Dell, smoke moved at a good clip from the lower front bezel, past the hard drive, and out through the gaps in the wind tunnel. The pattern was much clearer than the wind chop that affected the configuration on the SC-750A case.

As is to be expected in a case with few fans, there were several dead-air spots, specifically around the lower PCI slots and drive bays. We'd recommend installing a PCI exhaust fan, a supplemental external power supply exhaust fan, and also a hard drive cooler to wipe out excess heat in the trouble areas.



In the Dell's case, cool air is sucked in past the hard drives, making a beeline for the wind tunnel where it is vented. However, a massive dead spot covers the PCI cards.

What to Do at Home

Every PC case is different, so we don't recommend that you immediately tweak your PC based on what we learned from our two case studies. Instead, grab a thermometer gun (like the Raytek MiniTemp), and set up your own tests. Measure the temperature around typical hotspots (memory, CPU, 3D accelerator, and hard drives), then tailor your cooling solution to fit your case's needs.

As a general rule, we found that having more intake fans than exhaust fans can actually impede airflow. If anything, you'd do well to have extra exhaust fans to complement your puny power supply fan (which also exhausts air, but at a meager pace). The extra exhaust fans will actually draw a small amount air into the case as a natural part of their functionality, then scoot out all the hot air generated by your components. Bottom line: It's better to blow air out than to suck air in.

If you have a hot AGP card, or PCI cards that generate excess heat, some form of active cooling around the expansion slots could benefit your case's climate. Consider a fan that fits into a spare expansion slot (see our cooling reviews, starting on page 34). Any type of device that can get air moving in this area is good.

We can't wait for Serial ATA to become standard. Until then, consider using zip ties or velcro straps to lash down the cables in your case. If you have lots of ribbon cables floating around your system, consider buying some pre-split IDE cables that are a little more aerodynamic. Also check www.plycon.com for more info on rounded IDE ribbons.

Unless you have a proper exhaust system, CPU fans do little more than blow hot air around your case. So if you have an unused fan mount behind your CPUs, take advantage of it by adding another fan that blows air out. If you don't want to fool with adding additional fans, consider picking up a power supply equipped with a better fan. We recommend something from PC Power and Cooling.

If nothing else, our little experiment proved that brute force isn't necessary when cooling your PC. A well-designed cooling scheme using two fans is just as effective at ventilating your case as adding 15 fans but not having any overall plan. ■

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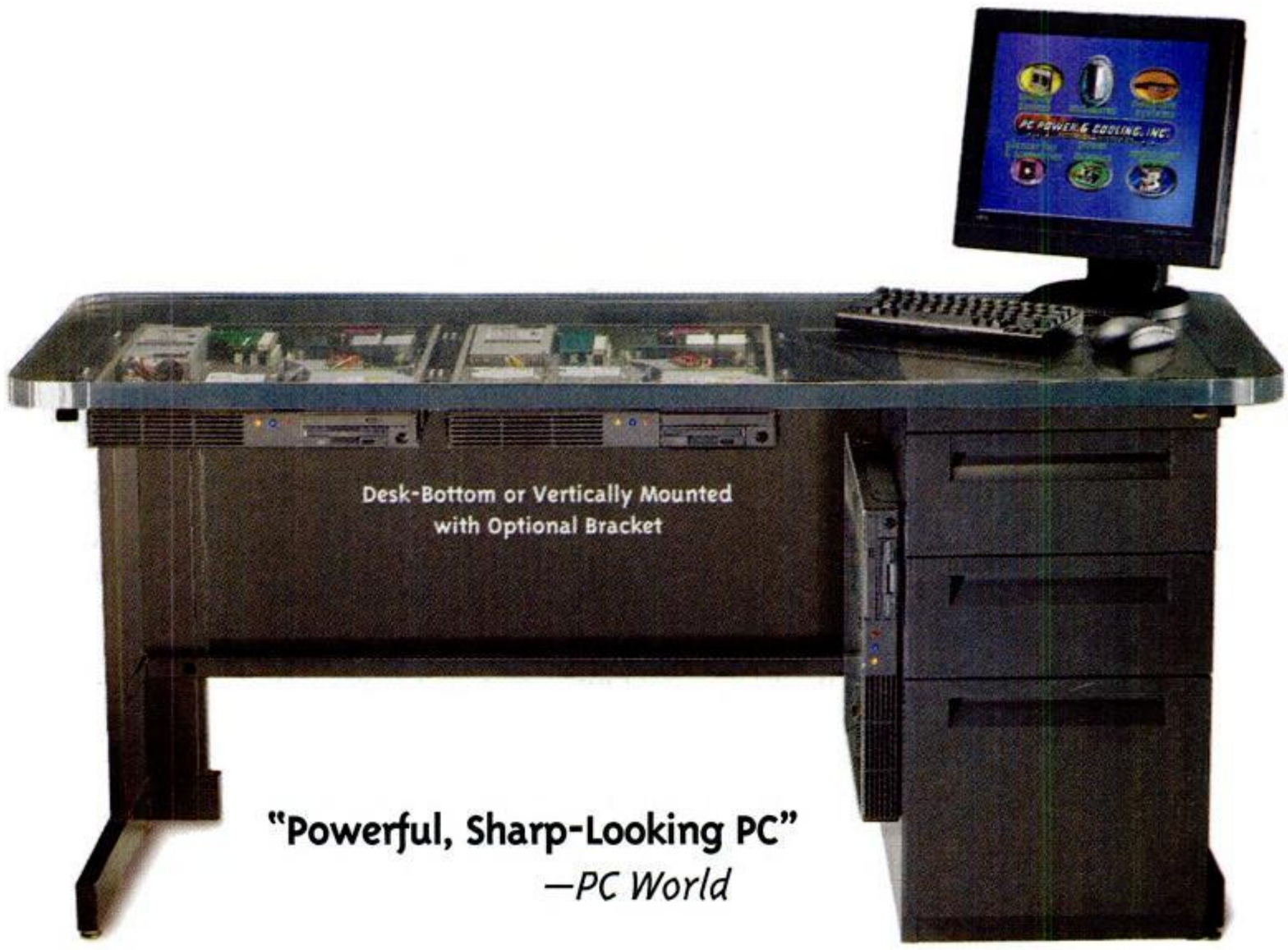

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How To...

PAINT YOUR CASE

Learn how the pros at Falcon Northwest turn an ordinary computer case into something extraordinary, and how you can paint your own case at home

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HARD
XXX

EDITED BY KATHERINE STEVENSON

Regular readers of *Maximum PC* are probably familiar with the spectacular paint jobs that adorn Falcon Northwest's gaming PCs. Indeed, the Medford, Oregon-based company actually commissions a professional auto-painting operation to provide the craftsmanship and customization that characterize Falcon PCs.

So it should come as no surprise that we chose Falcon Northwest to paint and decal Dream Machine 2002—a no-holds-barred celebration of the best a desktop computer can be. You can check out our September 2002 issue for stunning pictures of the rig, but seeing the finished product is only half the fun. We asked Kelt Reeves, Falcon Northwest's president, to take us on a guided tour of the PC's aesthetic transformation, from its humble beginnings to beauteous end. Follow along as the unassuming CoolerMaster ATC-110 you see pictured here becomes the looker that is *Maximum PC's* latest Dream Machine.

Wherever possible we've provided our own tips for painting a case at home—thanks goes out to all the *Maximum PC* readers who contributed suggestions.

Our virgin case sans the paint and decals.

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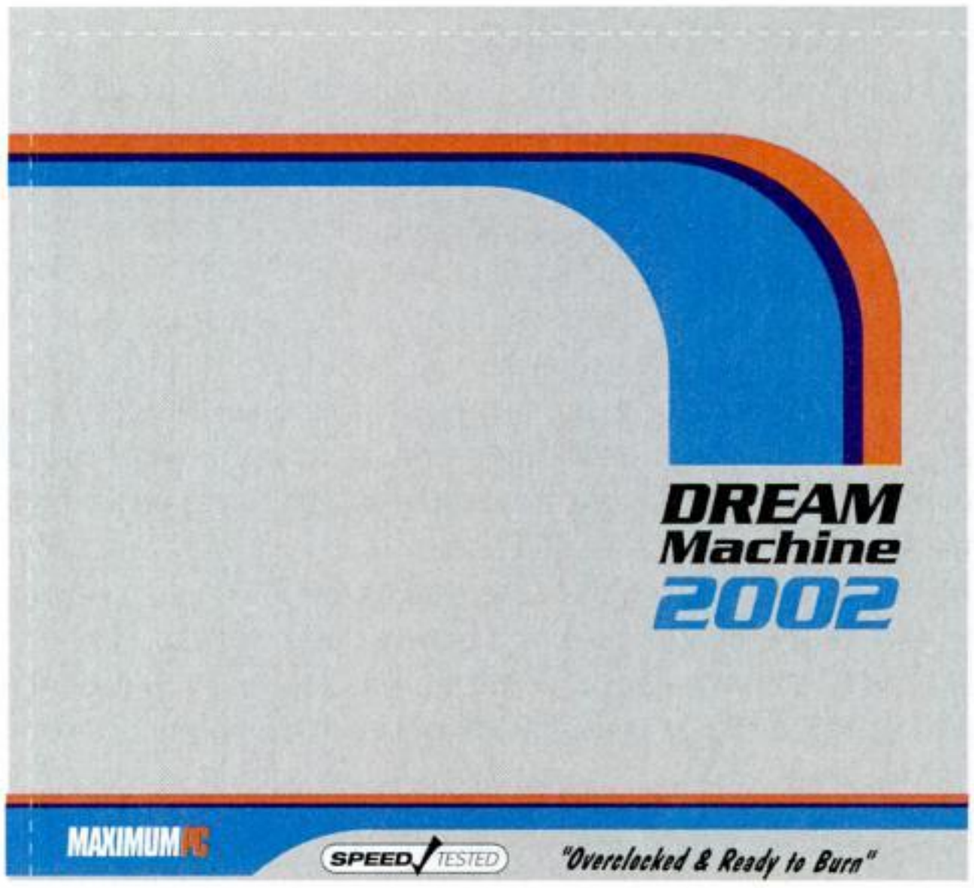
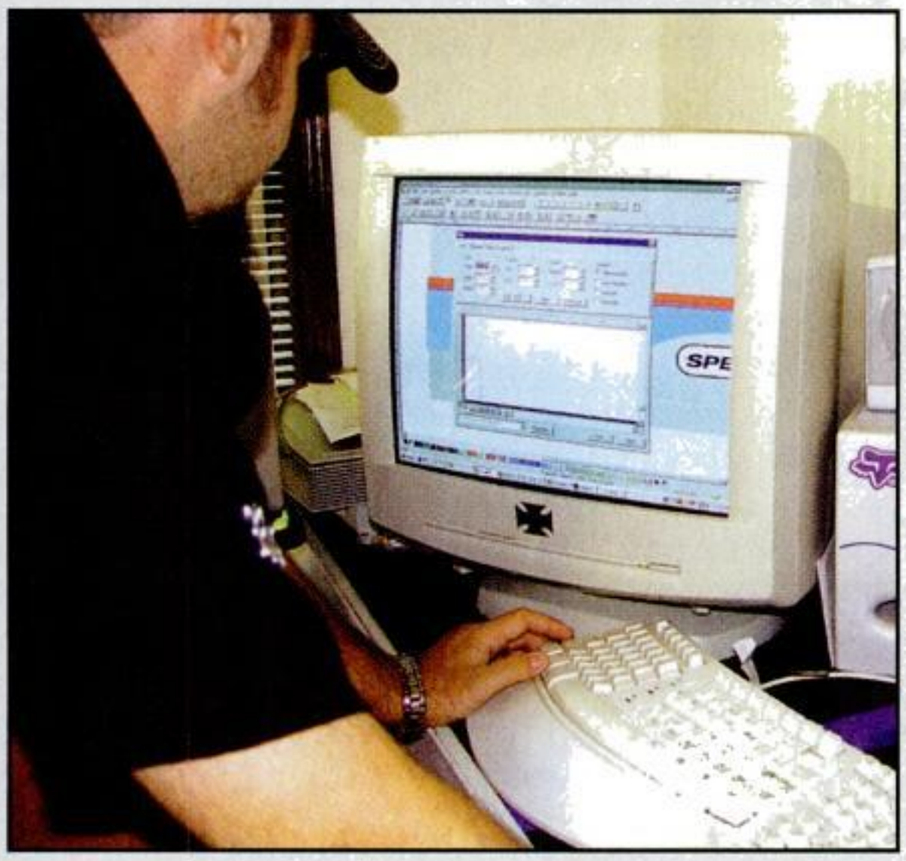
Step 1: Get Yourself an Art Department

Creating your basic design can be the most challenging part, because practically anything you can imagine can be applied to a case. The inspiration for *Maximum PC's* Dream Machine was a BMW 2002Turbo sports car, and our goal was to translate the classic car's aesthetic to a square-shaped box. *Maximum PC* made this step easy on us: Art Director Natalie Jeday created her own design in Adobe *Illustrator*, a vector-based drawing program, which is exactly what vinyl graphics shops like to work from.

Falcon Northwest has executed case designs that range from a simple single-color paint job to any combination of vinyl lettering, graphics, airbrushing, and even embedded full-color photographs and artwork. The *Maximum PC* Dream Machine called for just paint and vinyl—lots of vinyl. Vinyl can be used for actual decals that are embedded in the paint, or to mask areas of the case during painting. Since we were able to obtain vinyl in all the colors *Maximum PC* had specified, we decided to apply the vinyl to the case instead of having masks made.





Step 2: Off to the Vinyl Shop

Vinyl graphics are used on everything from street signs, to race cars, to those annoying decals of a peeing Calvin that you see on the back window of pickup trucks. Luckily for us, Nick and Gary from Razor's Edge vinyl shop in Medford can create all types of vinyl graphics. You, too, almost certainly have a vinyl shop in your hometown.

Vinyl graphics cutting is done on a specialized machine called a "plotter." The plotter essentially draws a line between two points. But instead of using pen on paper, vinyl plotters use a wickedly sharp blade on paper-backed vinyl. Before the vinyl can be cut, the vinyl artist will go over every vector in the design to ensure that every line of every letter is complete and will cut properly. Once the design is ready, it's then translated into special vinyl-cutting software. In this case, it's *Flexisign Pro*, a $5,000 program designed for signmakers. One of the unique features of this program is that it allows printing by color. Since the vinyl sheets have to be loaded and cut one color at a time, this software makes it easy to cut only the parts of the design that use the color you're currently working on.

Step 3: Cutting the Vinyl Graphics

The vinyl itself is interesting stuff. It's waterproof, fade resistant, comes in hundreds of colors, metallics, and even reflective surfaces (as you've probably seen on emergency vehicles). The vinyl is actually a soft PVC film with an adhesive backing, mounted on silicon paper.

The plotter that Razor's Edge uses is an amazing piece of precision equipment. Just the blades for this beast run $30 a piece, and typically last just two weeks. With tolerances literally down to millionths of an inch, the plotter can score the 2-millimeter thick vinyl just deep enough to cut it, without cutting all the way through its paper backing. One-millionth of an inch too shallow, and the vinyl won't cut. One-millionth of an inch too deep, and the paper will cut through—outputting your job as a horrendous pile of confetti. Here we see the SummaGraphics plotter in action.

Maximum PC suggests: If you want to apply vinyl to your case, we strongly recommend that you have it cut at a vinyl shop. Creating your own decal would require you to trace a printout using a razor blade knife. The vinyl itself is not printable with either an inkjet (remember, it's waterproof) or laser printer (it will melt, and could catch fire).

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Step 4: Weeding Sucks

I asked Nick why he was cutting out several copies of each vinyl graphic when the case design called for just one set. The answer became clear when Nick pulled excess vinyl from around the freshly cut graphics, a process called "weeding." While the large stripes stayed put, fully one-third of the small letters pulled off with the excess material. "Acceptable losses," Nick said. Evidently, in the vinyl game, you throw away much more material than you actually keep. Vinyl is very elastic, and thin pieces are easily pulled off (or stretched by accident) during weeding. For this reason, pinstripes of 1/8-inch or less are nearly impossible to create with vinyl. And, as if that weren't enough, every center of every closed letter has to be painstakingly removed from the paper backing with a razor blade—by hand. Surprisingly, Nick still has his eyesight and most of his sanity.

Maximum PC suggests: As you might surmise, it pays to have your vinyl shop run off multiple copies of whatever you want to apply to your case. If you somehow stretch your decal or get it all stickied-up, you'll want a backup copy. We should also note that some shops won't even do single-logo jobs; minimum quantities will vary.

Step 5: Get Yourself the Best Auto Painter on the West Coast

I thought it was a crime to paint the beautiful aluminum CoolerMaster cases—until I saw Jim's work. Jim (we'll just call him Jim because he's in the Witness Relocation Program) is a Master car painter. I say "Master" with a capital "M" because that's actually a level in his trade. Jim has been painting cars for more than 20 years and has won many awards and car show competitions.

Jim works at the largest auto-body shop on the west coast. We'd give you the name of the shop, but it too is in the Witness Relocation Program. This 40,000 square foot shop paints more than 400 cars every month and has five car-size ovens for baking on the auto paint. Each of these "thermal downdraft" car ovens costs upwards of $250,000, has its own built-in life support system, and can bake a car (or PC) at up to 300 degrees. After seeing the work Jim does on cars and motorcycles like this one, we knew he was up to the challenge of our PC cases.

Maximum PC suggests: You may be able to find an auto body shop in your area that will take on your job. Call around. Or finish reading this article, and decide if you're ready to paint your own rig at home.

Step 6: Smells Like... Brain Damage

For the Dream Machine to remain true to its 1973 BMW 2002 Turbo inspiration, we needed an exact match of the classic car's original factory paint—"Polaris Silver." But how do you match a car that hasn't been manufactured in almost 30 years? A specialized Sartorius ColorMix computer is used for the task. The machine contains a database of every color on every car ever manufactured and the color elements that comprise them. The computer tells the "mixmaster" which pigments to mix, by weight, and he pours them into a can on a scale connected to the computer.

Because the Polaris Silver we mixed is an exact replica of the 1973 BMW factory paint, it's not as bright or "metallic" as paints made today. Evidently, in 1973, paint makers couldn't achieve the suspension of the courser metallic flakes used in today's metallics and pearlcoats. *Maximum PC* intentionally sacrificed some flashiness to be faithful to the original automobile.

Professional auto paints consist of chemicals that are much tougher and more beautiful than anything you can find at your local paint store. But they're also much more dangerous. For this reason, most professional paint stores will not sell to the general public.

Maximum PC suggests: Your paint options may be limited, but be sure to choose an automotive-grade paint, or one that's recommended for the surface you're working on. A spray can is the recommended method of application in the absence of a professional spray gun.

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Step 7: Reduce Your Case to Pieces

Auto paints require intense heat to dry, and auto ovens can melt a plastic grill right out of a car should a painter neglect to remove it. So a baked-on finish is not something to attempt with any plastic or plastic-fronted PC. Even the Dream Machine's all-aluminum ATC-110 has plastic fans, wiring, and LEDs that must all be removed by hand, lest they turn into a puddle of goo during the baking process. Here Randy is using heavy-duty tape to secure each piece of the case to the spray tables.

Maximum PC suggests: Obviously, if you decide to have a plastic case painted, baking is out of the question.

Step 8: Totally Ruin a Fine Finish

If you want to make a new paint job stick, you've got to first strip off all traces of its original finish. You'll notice the painter's working with rubber gloves. Any salts or acids from your fingers will soak into aluminum (a very porous metal) and ruin the paint later on. It's possible to have a fingerprint show through 15 layers of paintwork, so wearing gloves is critical.

Maximum PC suggests: An orbital sander and 220 sandpaper is another way to take the finish off a metal case. On a plastic case, your concern is cleaning the surface of release agents (chemicals used to release the case from its mold). For this, stick to a Scotch Brite pad and soapy water.

Step 9: Fun with Acid

Please add phosphoric acid to the list of products "our lawyer says we can't recommend you use at home." This lovely substance is a light acid wash that Jim uses to rub down all the painted surfaces. The phosphoric acid eats away a tiny bit of the aluminum, removing microscopic corrosion already present in any exposed metal. It provides good clean metal for the paint to bond with, and without this vital step, the paint won't adhere correctly and may flake off.

Maximum PC suggests: A product such as Jasco Metal Etch contains phosphoric acid and is suitable for prepping metals before painting. It costs about $4 a bottle and can be purchased at most hardware stores. Follow the safety instructions, and be sure to rinse the case's surface with water when you're done.

Step 10: First Layer... And It's Still Not Paint

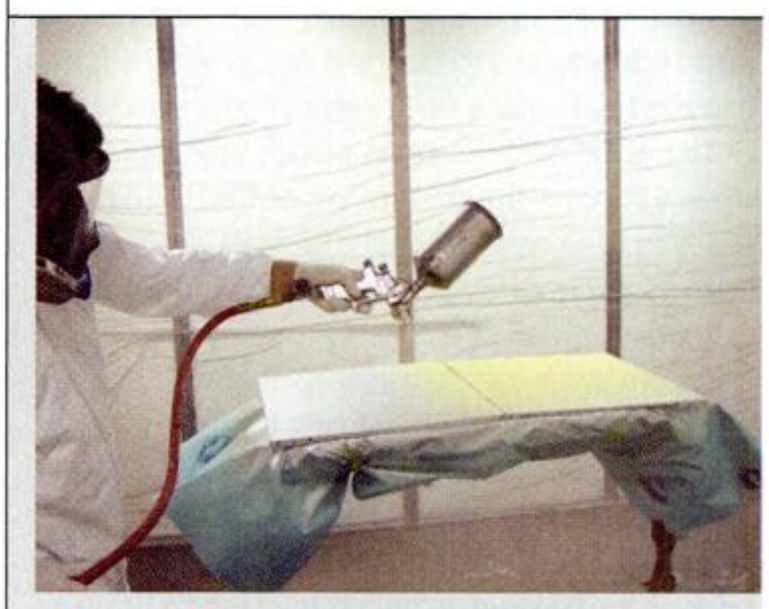
Our panels are finally ready for the first of the 15 layers that will be applied to them. The first layer is Zinc Chromate, known more commonly as aluminum etch. This yellowish goo provides a layer of corrosion protection for the freshly exposed aluminum. Yes, aluminum rusts, but it's not the normally reddish-brown rust. Aluminum oxidization actually looks like fine white powder, and it will ruin a paint job.

Maximum PC suggests: Because it's a highly toxic substance, Zinc Chromate cannot be found just anywhere. In California, for instance, its use is strictly regulated. So you may just want to play it safe and substitute Zinc Chromate with a couple layers of sprayed-on primer (be your case metal or plastic).

Step 11: Let's Mix Toxins!

I mentioned before that the Polaris Silver brew was just the pigment. Now Jim is going to mix in the chemicals that will turn it into paint: reducer and activator. Jim, an avid *Maximum PC* reader, explained that the "reducer is like the PCI bus, it carries the paint through the system to its destination." The activator is a hardener that quickly dries the paint layers and makes them tougher. It does this via a process called "gassing out" — essentially the solvents vaporize leaving behind a tough layer of pigment. The whole concoction is loaded into Jim's Satajet 90 pneumatic spray gun that he uses specifically for base-coat jobs.

Maximum PC suggests: It's unlikely you'll have access to professional acrylic-urethane paint, so you'll probably be using enamel paint in a spray can. While enamel isn't as strong or chemical resistant, it also doesn't need to be baked.



Step 12: Applying the Base Coat

While many colors require just two base coats to achieve the desired shade, silver is very "transparent." So three layers are necessary for a proper coating. Between each layer of silver base coat, Jim lets the paint gas out for five to seven minutes. If the solvents aren't allowed this time to evaporate, the paint will eventually blister and pop where the gas has been trapped.

Maximum PC suggests: With enamel, you'll want your paint to gas out for at least 30 minutes between coats. When applying coats, use smooth, even strokes that go in the same direction. Multiple thin coats are better than a single thick coat. Always gas out in between.

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Step 13: Clear Coat Can Kill

You may remember the Jonestown massacre in 1978, wherein a cult leader killed more than 900 followers by giving them Kool-Aid laced with isocyanate—a deadly poison if ingested. Since paint manufacturers seem to love deadly chemicals, they use isocyanate in making high-solids acrylic urethane, or clear coat. And the fact is, clear coat makes all paint jobs look better; it gives both cars and Falcon PCs that gorgeous sheen. It's perfectly safe after baking, but in its liquid state it must not be touched, inhaled, or mixed with Kool-Aid because it can kill you.

In fact, isocyanate vapors can permeate your skin, causing cirrhosis of the liver, internal bleeding, and the whites of your eyes to turn yellow. Jim said that many old-school car painters refused to use the carbon filter gas-masks that allow safe use of isocyanates. Since your body cannot purge isocyanates, once you've inhaled enough of this stuff over the years, a mere whiff of it will make you vomit. According to Jim, a lot of the older guys doing car pinstriping today were once painters who inhaled too much isocyanate and can no longer tolerate being near the stuff.

But clear coat looks really sexy, so we decided to use lots of it. We started by applying clear coat over the base coat to give our vinyl graphics a perfect, smooth surface to adhere to. There will be much more clear coating later on. For the clear coats, Jim uses a different spray gun, a SataJetRP. It provides very quick atomization of the acrylic urethane as it's ejected form the spray gun, and this prevents clumping.

Maximum PC suggests: You can buy cans of enamel clear coat at the same shop where you buy your enamel paint. The two substances work fine together, but for best results you should stick with the same manufacturer for both your paint and clear coat. And to be extra safe, do a test run on a small area (such as drive rail) to ensure your paint and clear coat work well together.

Step 14: Preheat Oven and Bake

After the first clear layer has been applied, the finish needs to be baked on. For standard paintwork without vinyl graphics, we would have applied three layers of the clear coat, and then done the baking. However, the vinyl graphics need to be applied to an already baked, "finished" paint job. So after applying aluminum etch, three layers of base coat, and a first layer of clear coat, we put our parts into the oven.

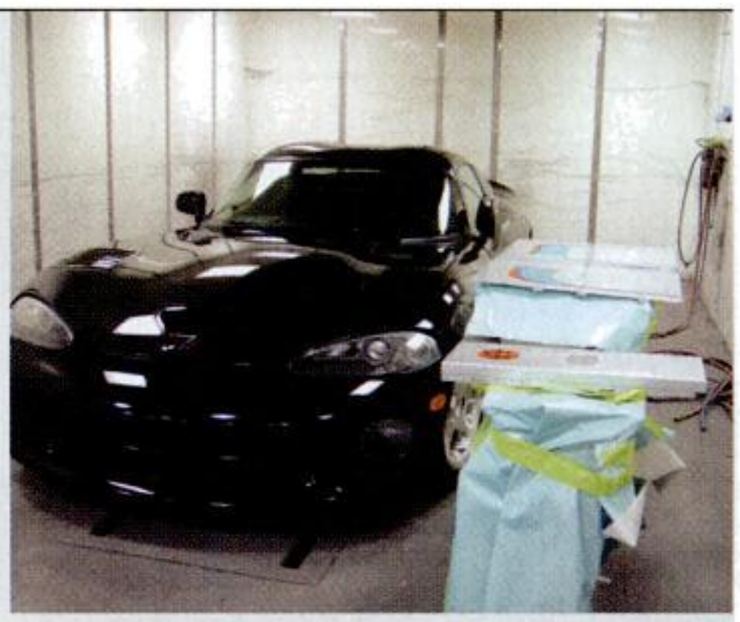
Maximum PC suggests: While we do know of a few readers who've baked painted PCs inside their kitchen ovens, we can't recommend that you go down this dubious path. Also, most do-it-yourselfers use enamel paint, and baking is therefore a non-issue.

Step 16: Sweet, Sweet Clear Coat...

When you apply two layers of vinyl to a case panel, the vinyl naturally sticks above your paintwork in places. This vinyl has to be protected by submerging it in clear coat until the surface of the case is once again smooth and perfect. We did this with five more layers of clear coat. Once two or three new layers of clear coat have been applied, they again need to be baked. You can't do too many layers of clear without baking them on, as they'll start to pool and get uneven if applied too thickly when wet. So after we baked our second layer of clear coat, another two layers of clear coat were added and the PC was baked for a third time.

Step: 15: Laying Down the Vinyl

Once our clear coat was ready, we needed to lay our vinyl stickers in the approximate positions dictated by *Maximum PC's* art director. In order to position the decals accurately we applied tape as guides to keep our lines exactingly straight, and used "application fluid"—a slippery substance that allows the decals to be moved around a bit after their sticky backing has been exposed. You can also use soap and water for this stage. Many of our graphics, such as "speed tested" were actually multilayered. The black layer went down first, we let it dry a bit, and then the white layer was wet down and placed on top. Lastly, we soaked the transfer paper so it could be carefully peeled away.



Step 17: Mmmm... Fresh Baked Viper!

Since Jim's oven burns $100 worth of electricity every time its run, the Master painter usually bakes our parts along with a car he's working on. In this shot, you can see *Maximum PC's* case baking alongside an $80,000 Dodge Viper! (Let's hope the owner of the car understands the honor he was bestowed.)

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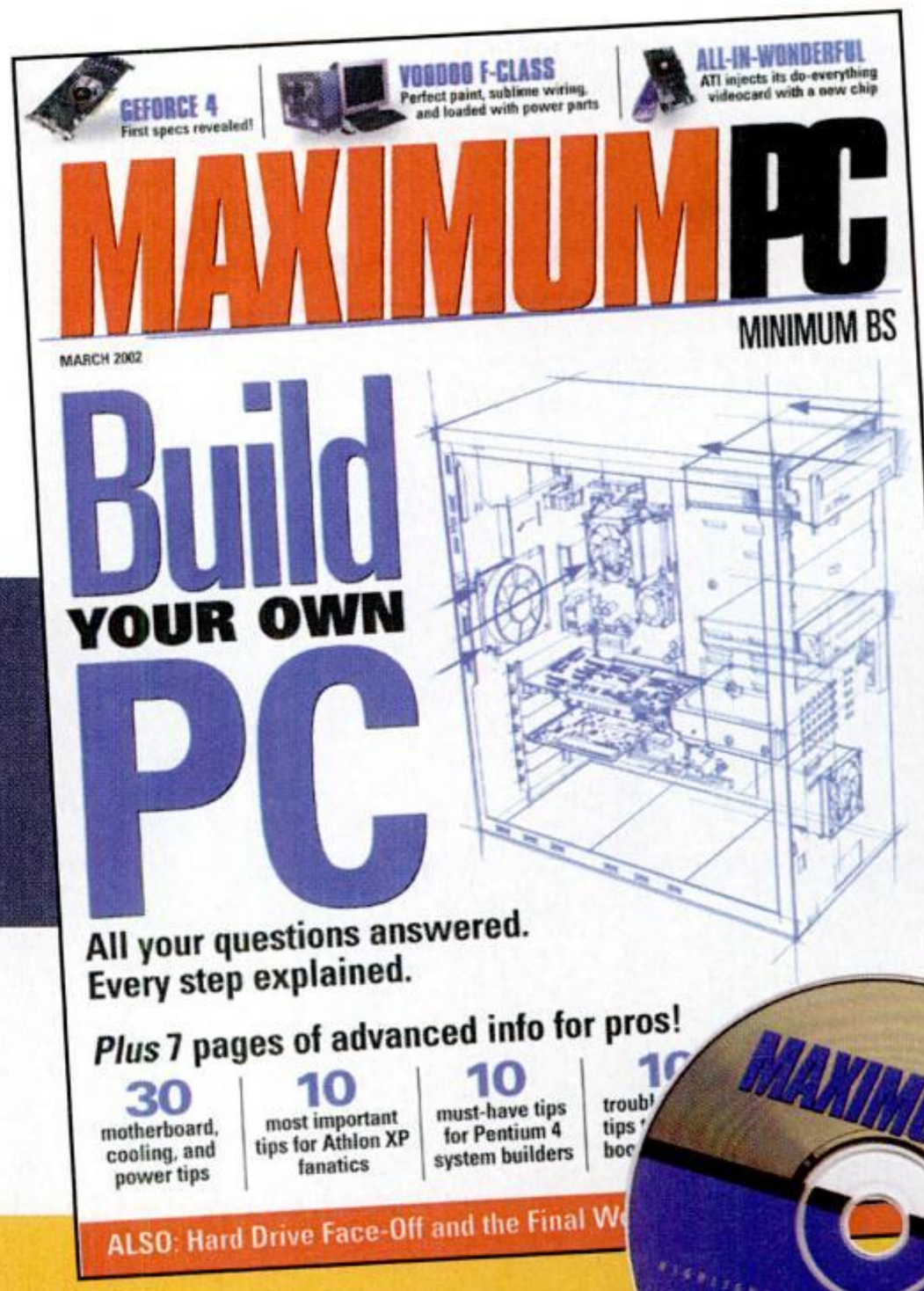
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Step 18: Finishing Up

After all the larger pieces of the case were decaled, there was still some detail work to attend to. It turns out the vinyl stripes we had made for the front air grill were exactly the width of the grill, but we needed that color to wrap around the edges a bit so no gaps would show when it's installed. So Jim had to match tiny bits of blue, purple, and red paint to the color of the vinyl, and he used a small artist's airbrush for this detail work. Here we seem Jim carefully masking and painting half of the tiny reset button where a stripe crosses it.

Step 19: How to Scratch That Beautiful Clear Coat

Despite Jim's precision gunning, clear coat is never 100 percent perfect at first. It will have a few broken bubbles and imperfections that need to be sanded out. For this, Jim uses the application fluid again, and a fine grit sandpaper.

Once sanded, the clear coat's imperfections will be gone, but the sandpaper will make it look hazy due to the thousands of fine scratches just made. To bring out its brilliant shine, Jim uses 3M's "Perfect-It" rubbing compound. Rubbing compound is basically very fine grit liquid sandpaper. He applies it with a pneumatic polisher and two different grades of foam discs (one soft, one really soft), and polishes it to a gorgeous shine.

Step 20: "He never drives it, Ferris, he just polishes it with a diaper"

Just like any other fine automobile finish, the Dream Machine looks best when you can see your reflection in the shine. To achieve this effect, Jim applies a thin layer of car wax. Not just any car wax, mind you. New paint jobs are "soft" for about their first six months of life. Tiny bits of solvents will gas out of the finish during this time, hardening the paint to a tough protective shell. It's important during the first six months that these solvents not be trapped in the paint, lest they cause blistering and cracking. So be sure to use a wax that's labeled "breathable," or that's specifically intended for new paint jobs. ■

Step 21: Enjoy!

For more case painting tips, see the "Sub-Zero" how-to in the Extras folder on the disc that came with this magazine.

Master painter Jim Saling will take questions regarding home projects at his web site: www.smoothcreations.com (*oops*, did we just blow his cover?).

Copyrighted material

SOFTWARE

Windows XP is Microsoft's best OS, but it can still benefit from some well-placed **system tweaks**. Next up, we show you how easy it is to **make a full-length DV movie**. After that, check out our **security how-to**, then dig into one of the most hardcore articles in the whole magazine, a primer on **building 3D models**. From there, we show you how to become a **digital photo** master, and how to **make your own Linux-based server**. We end with **MP3 ripping and encoding** strategies for hardcore audiophiles.

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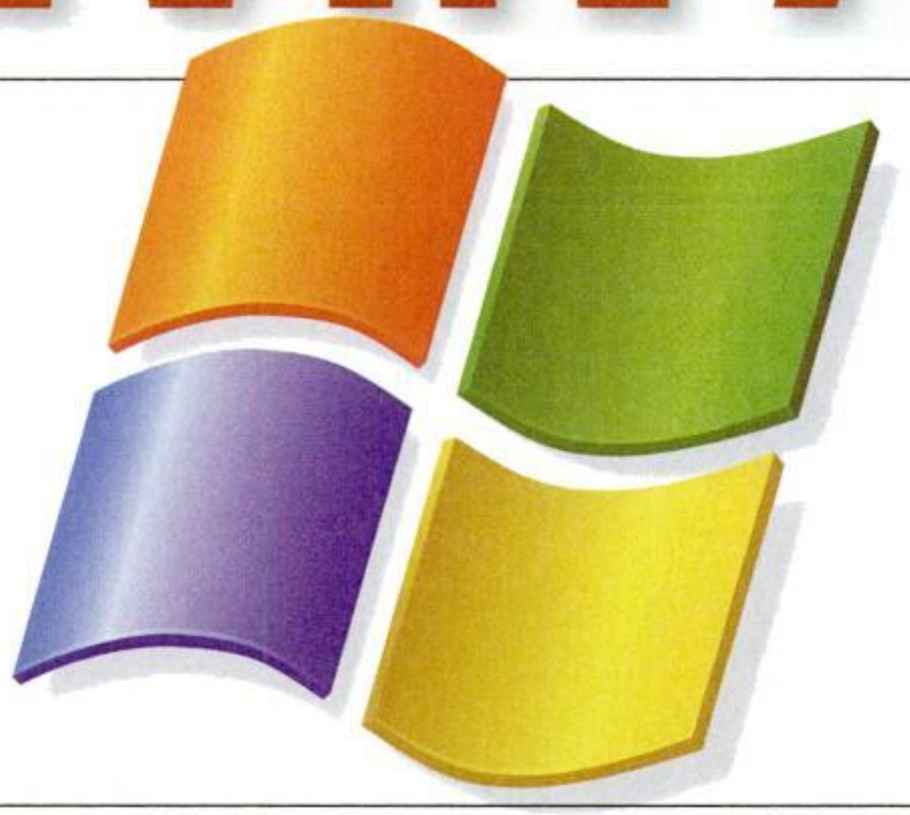
How To...

GET THE MOST FROM WIN XP

Tweak everything about Windows XP, from your boot time to your Start menu

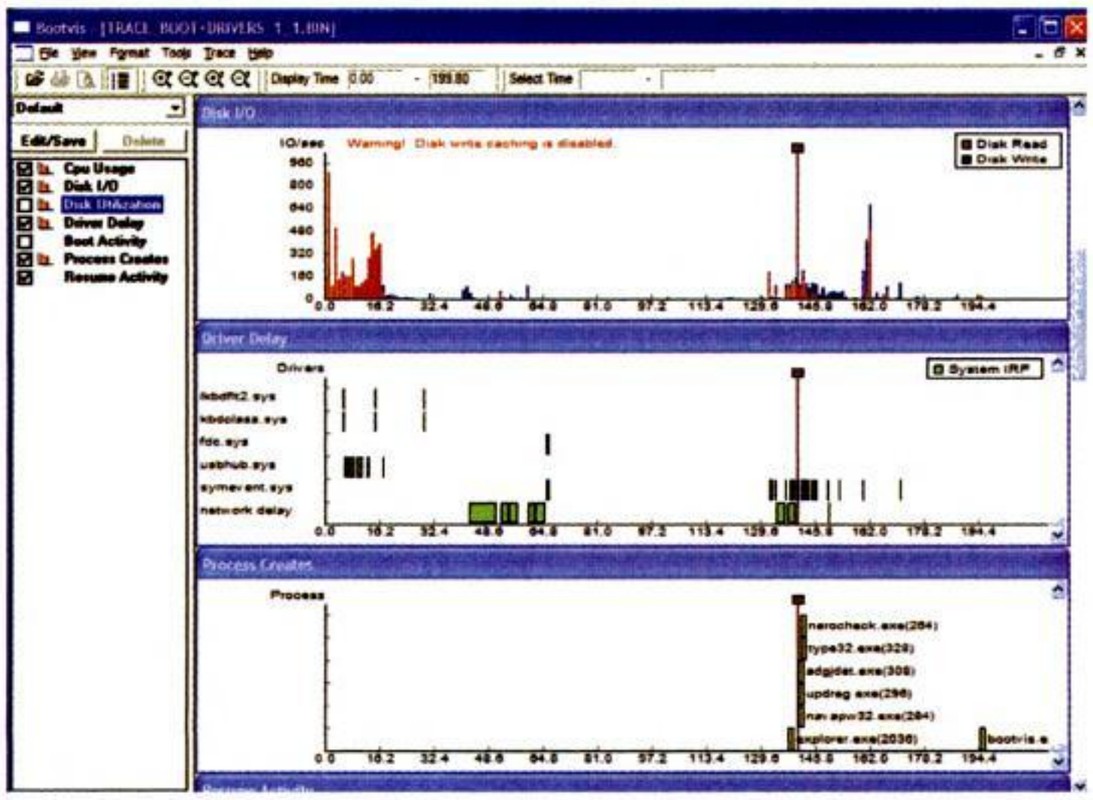
MAXIMUMPC
DIFFICULTY RATING
EASY



BY WILL SMITH

Even though Windows XP is the best operating system Microsoft has ever shipped, it can still benefit from a bit of tweaking. Whether you're trying to speed up system performance, conserve a few gigs of hard disk space, or just add a handy new feature to the interface, a fine adjustment here or there can make a world of difference.

Submitted for your approval, we give you our 13 favorite WinXP tips and tricks.



Improve Your Boot Speed

A handy little app called *Bootvis* is available on the Microsoft web site—search for "bootvis" at **www.microsoft.com**. The software analyzes your PC's boot process and checks for slow-starting drivers, apps, and even OS components. If all you want to do is make your PC boot faster, download *Bootvis* and run the program. Then go to Trace, then Optimize. If you want to see how much faster your PC is after *Bootvis* has done its job, go to Trace, Next boot + Driver Delays.

Bootvis will restart your system and monitor the way each driver and TSR loads, then it will optimize their positions on your hard drive. This will allow your drive to feed your OS with information as quickly as possible, and should significantly shorten boot times.

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Run Command-Line Apps Fast, Fast, Fast

If you frequently run command line applications, you'll want to know the Address bar's dirty little secret: Not only does the Taskbar's Address bar give you a quick way to launch your favorite web sites, but you can also run applications by typing the program's name into the Address bar.

Putting the Address bar onto the Taskbar is as easy as right-clicking the Taskbar, going to Toolbars, and selecting Address. You can drag the bar to an empty, convenient place on your Taskbar, where it will live forever.

Don't know what to type to open your program? It's easy to find out. Right click on the shortcut you use to open the program, go to Properties, and look in the Target box. All you need is the app's name, which usually ends with .exe, .com, or possibly .bat.

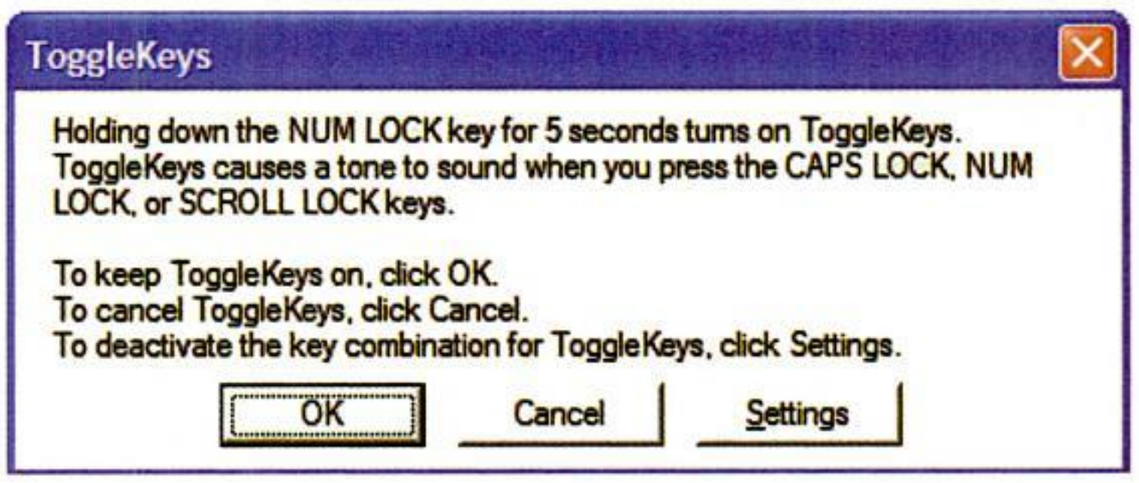
Shortcuts, Shortcuts Everywhere

WinXP includes literally hundreds of handy keyboard shortcuts, but we bet you don't know about the Windows key shortcuts that make the 103rd and 104th keys on your keyboard worth fooling with.

- Windows key + Pause/break: Opens System Properties
- Windows key + l: Locks your workstation
- Windows key + d: Minimizes all windows
- Windows key + e: Opens Windows Explorer
- Windows key + r: Opens the Run dialog
- Windows key + f: Opens the Search Window

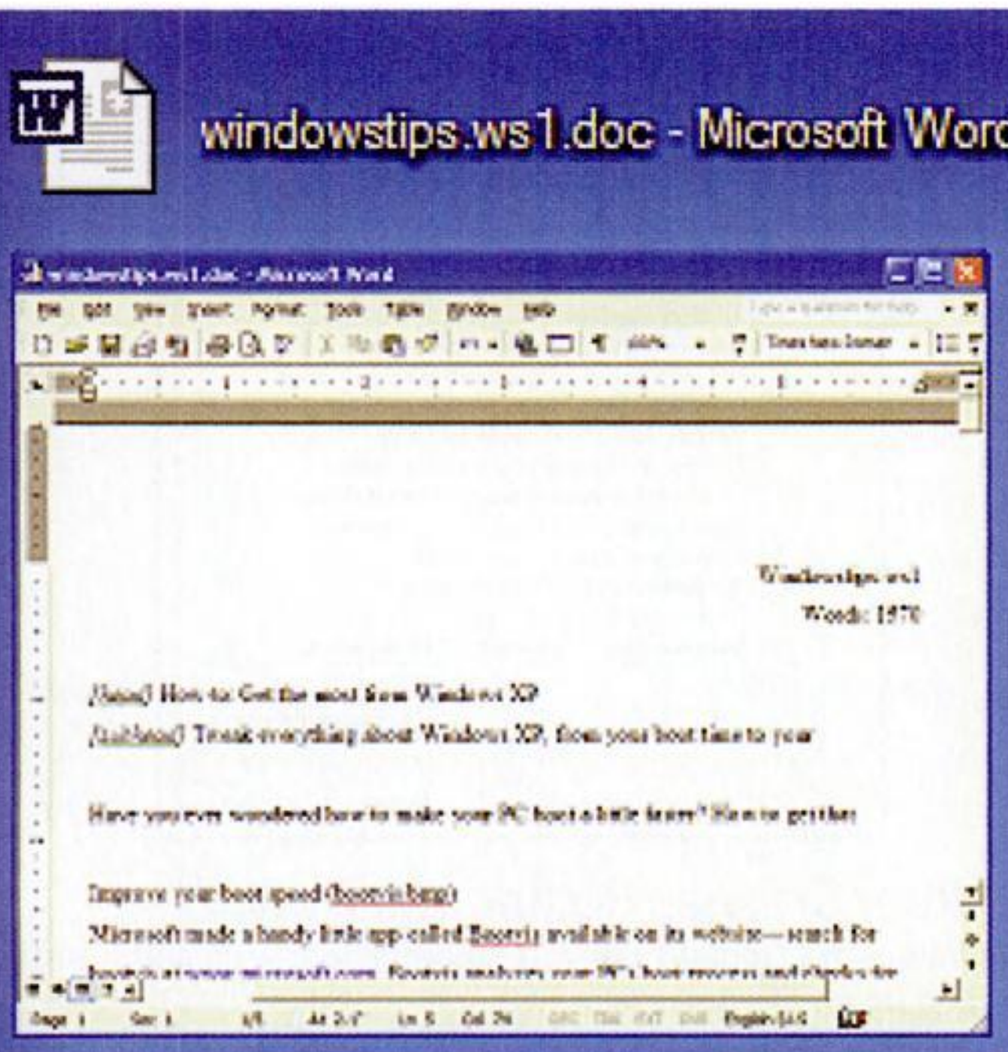
Optimize Your Disks at Will

One of WinXP's best tricks is that it places commonly used files on the faster sections of your hard drive to minimize load times. The only catch is that it does this only every three days. If you want to kick-start the operation, go to the Start Menu, then choose Run, and type `Rundll32.exe advapi32.dll,ProcessIdleTasks`. You should see some hard drive activity as your apps are rearranged on your platters.


ToggleKeys
Holding down the NUM LOCK key for 5 seconds turns on ToggleKeys. ToggleKeys causes a tone to sound when you press the CAPS LOCK, NUM LOCK, or SCROLL LOCK keys.
To keep ToggleKeys on, click OK.
To cancel ToggleKeys, click Cancel.
To deactivate the key combination for ToggleKeys, click Settings.
OK
Cancel
Settings

Save Yourself from ALL CAPS Accidents

Writing in ALL CAPS is the written version of screaming at the top of your lungs. If you accidentally press the CapsLock key, you can inadvertently scream at whomever you're e-mailing. To avoid this unintentional faux pas, hold down the NumLock key for five seconds to enable ToggleLock. ToggleLock is a handy, dandy built-in Windows feature that makes your PC beep whenever you toggle CapsLock, NumLock, or Scroll Lock on or off. NOWYOU HAVE NO EXCUSE FOR YELLING AT PEOPLE!



Switch Tasks a Whole New Way

Pressing Alt + Tab is the quickest way to change between different windows, but how do you know which of the five *Internet Explorer* windows is the one you really want? If you're using the Alt-Tab Replacement PowerToy from Microsoft, it's easy. Instead of seeing the application's icon in the Alt-Tab window, you see an actual image of the app that you're switching to. Very cool.

Head to **www.microsoft.com** and search for "Windows XP Power Toys." You should find a page with 10 separate PowerToy installers. Grab the Alt-Tab replacement, install it, and alt-tab your way to a new life.

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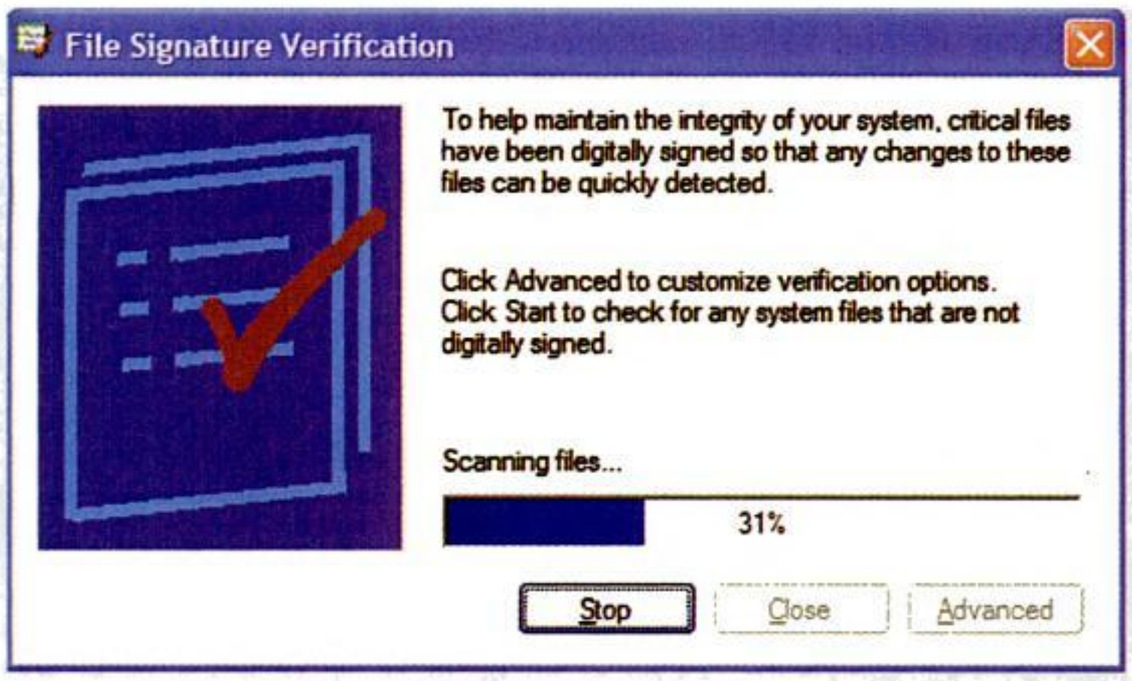
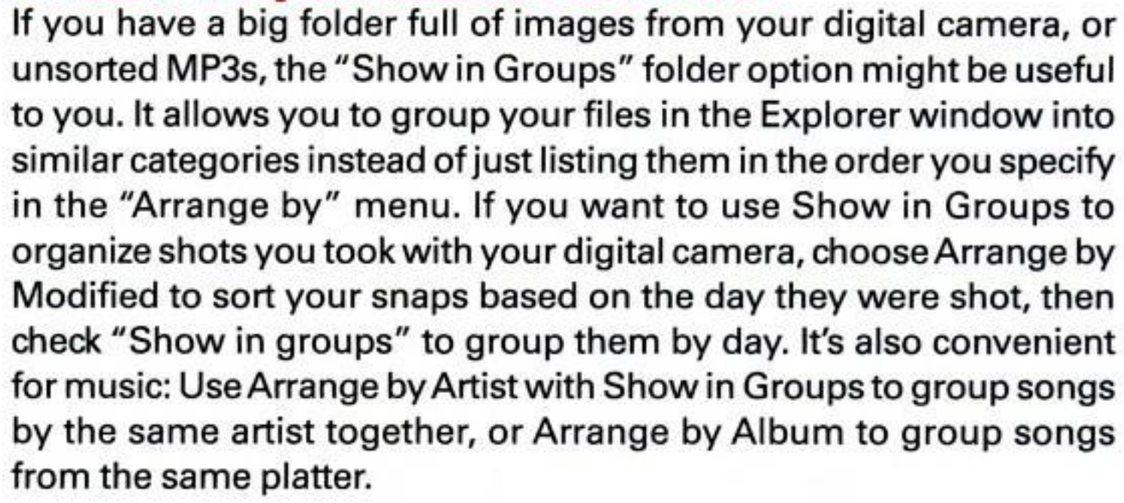

File Signature Verification
To help maintain the integrity of your system, critical files have been digitally signed so that any changes to these files can be quickly detected.
Click Advanced to customize verification options. Click Start to check for any system files that are not digitally signed.
Scanning files...
31%
Stop
Close
Advanced

Check for Signed Drivers

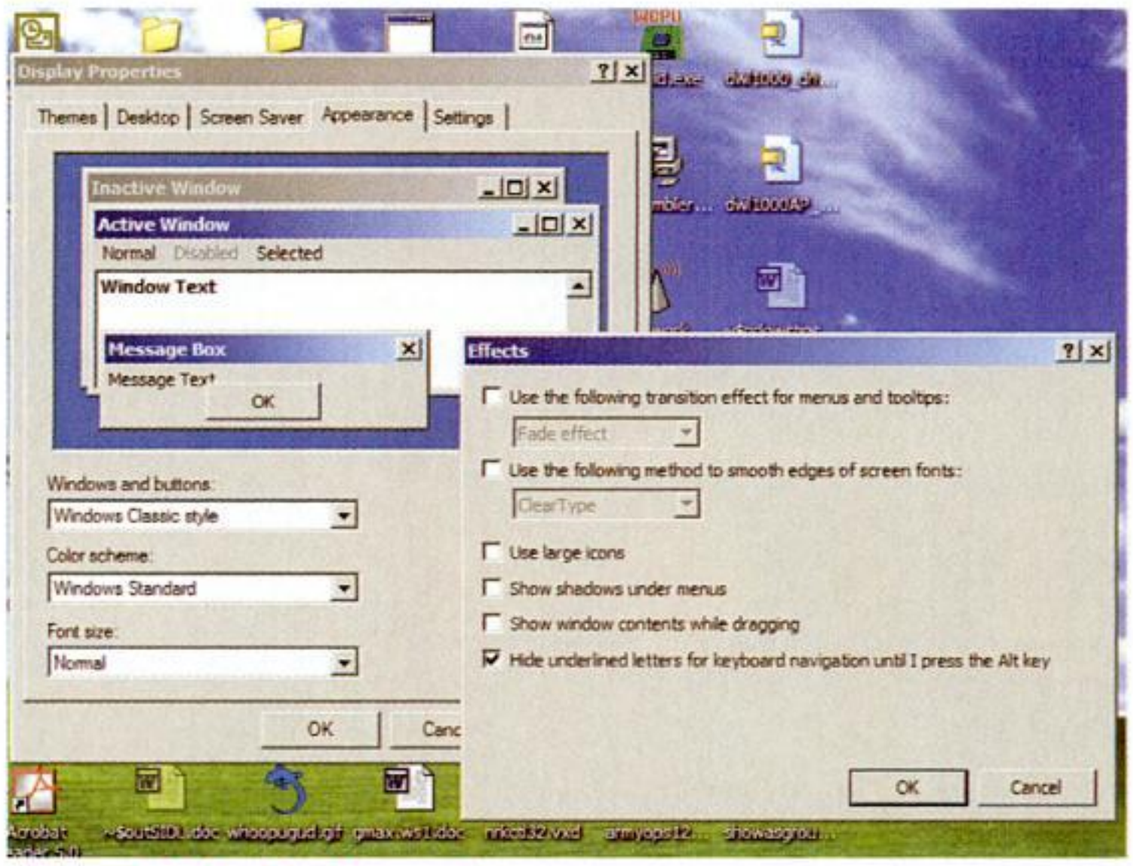
If it were up to the programming wizards at Microsoft, the entire world would run signed drivers. You see, a significant number of crashes and system errors can be traced back to broken drivers. But signed drivers have passed through the Microsoft Hardware Qualification Labs and should be more reliable and robust than unsigned drivers.

If your machine is crashing, and Windows is blaming it on a problem driver, go to the Run program under your Start menu, and fire up sigverif.exe to scan your system for unsigned drivers and other system files. Now visit your hardware manufacturers' web sites to find more up-to-date and signed versions of the drivers. Remember: Signed drivers are better, but unsigned drivers aren't necessarily bad, especially those that are updated frequently, like videocard drivers.


test
File Edit View Favorites Tools Help
Back Search Folders
Address C:\MP3\test
Go
Music Tasks
Play selection
Shop for music online
Copy to audio CD
File and Folder Tasks
Move the selected items
Copy the selected items
E-mail the selected items
Delete the selected items
Other Places
MP3
My Computer
My Network Places
Details
2 items selected.
Name Size Type Artist Album Title
Counting Crows
01 - Hangin' Around.mp3 5,829 KB mp3 file Counting Crows This Desert Life
02 - Mrs. Potter's Lullabye.mp3 10,909 KB mp3 file Counting Crows This Desert Life
05 - All My Friends.mp3 6,770 KB mp3 file Counting Crows This Desert Life
06 - High Life.mp3 8,916 KB mp3 file Counting Crows This Desert Life
Frank Sinatra
03_All The Way.mp3 3,378 KB mp3 file Frank Sinatra All The Best D...
05_Witchcraft.mp3 3,394 KB mp3 file Frank Sinatra All The Best D...
07_No One Ever Tells You.mp3 4,000 KB mp3 file Frank Sinatra All The Best D...
Jimi Hendrix
Jimi Hendrix - Burning Of The ... 4,290 KB mp3 file Jimi Hendrix Electric Ladyl...
Jimi Hendrix - Come On (Part ... 4,878 KB mp3 file Jimi Hendrix Electric Ladyl...
Jimi Hendrix - Crosstown Traf... 2,866 KB mp3 file Jimi Hendrix Electric Ladyl...
Jimi Hendrix - Gypsy Eyes.mp3 4,370 KB mp3 file Jimi Hendrix Electric Ladyl...
Jimi Hendrix - Have You Ever ... 2,566 KB mp3 file Jimi Hendrix Electric Ladyl...
Jimi Hendrix - All Along The W... 4,702 KB mp3 file Jimi Hendrix Electric Ladyl...
The Smiths
The Smiths - There Is a Light ... 4,755 KB mp3 file The Smiths The Queen Is...
The Smiths - The Boy With th... 3,853 KB mp3 file The Smiths The Queen Is...

A New Way to Look at Your Files

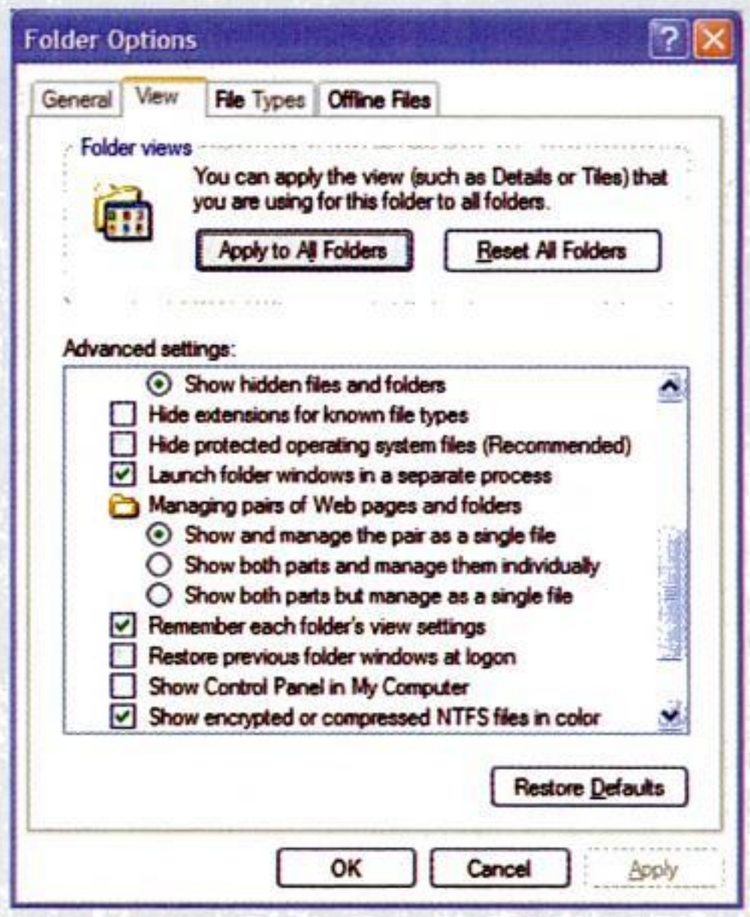
If you have a big folder full of images from your digital camera, or unsorted MP3s, the "Show in Groups" folder option might be useful to you. It allows you to group your files in the Explorer window into similar categories instead of just listing them in the order you specify in the "Arrange by" menu. If you want to use Show in Groups to organize shots you took with your digital camera, choose Arrange by Modified to sort your snaps based on the day they were shot, then check "Show in groups" to group them by day. It's also convenient for music: Use Arrange by Artist with Show in Groups to group songs by the same artist together, or Arrange by Album to group songs from the same platter.



Speed Up the Interface

We think WinXP's new interface is great, but we also run the latest hardware, so our machines easily fulfill the operating system's performance requirements. If the new Luna UI has got your older machine chugging along at 486 speeds, there are a few things you can do to pick up the pace.

First, go to the Display Properties Control Panel (right click an empty spot on your Desktop and choose Properties). Now choose the Appearance tab and click the Effects button. Uncheck the following: "Use the following transition effect for menus and tooltips," "Use the following method to smooth edges of screen fonts," "Show shadows under menus," and "Show window contents while dragging." If this doesn't speed up things enough, you can turn off the special user interface altogether by selecting "Windows Classic Style" from the Windows and Buttons menu on the Appearance tab. In the Lab, this has given us 5 to 10 percent faster scores in *SYSmark*.


Folder Options
General View File Types Offline Files
Folder views
You can apply the view (such as Details or Tiles) that you are using for this folder to all folders.
Apply to All Folders
Reset All Folders
Advanced settings:
Show hidden files and folders
Hide extensions for known file types
Hide protected operating system files (Recommended)
Launch folder windows in a separate process
Managing pairs of Web pages and folders
Show and manage the pair as a single file
Show both parts and manage them individually
Show both parts but manage as a single file
Remember each folder's view settings
Restore previous folder windows at logon
Show Control Panel in My Computer
Show encrypted or compressed NTFS files in color
Restore Defaults
OK
Cancel
Apply

Explorer Crashes Getting You Down?

If you're sick of a single Windows Explorer window crashing and then bringing down the rest of your OS with it, follow this tip: Open My Computer, go to Tools, then Folder Options. Click on the View tab, then scroll down to "Launch Folder windows in a separate process" and enable this option. Just be aware that you'll have to reboot your machine for this tip to take effect.

Now, if Explorer does crash on you, taking your Taskbar and Start menu with it, it's easy to get them back. Just press Control + Alt + Delete. Then File, then New Task, and type `explorer.exe` to start a fresh version of your shell.

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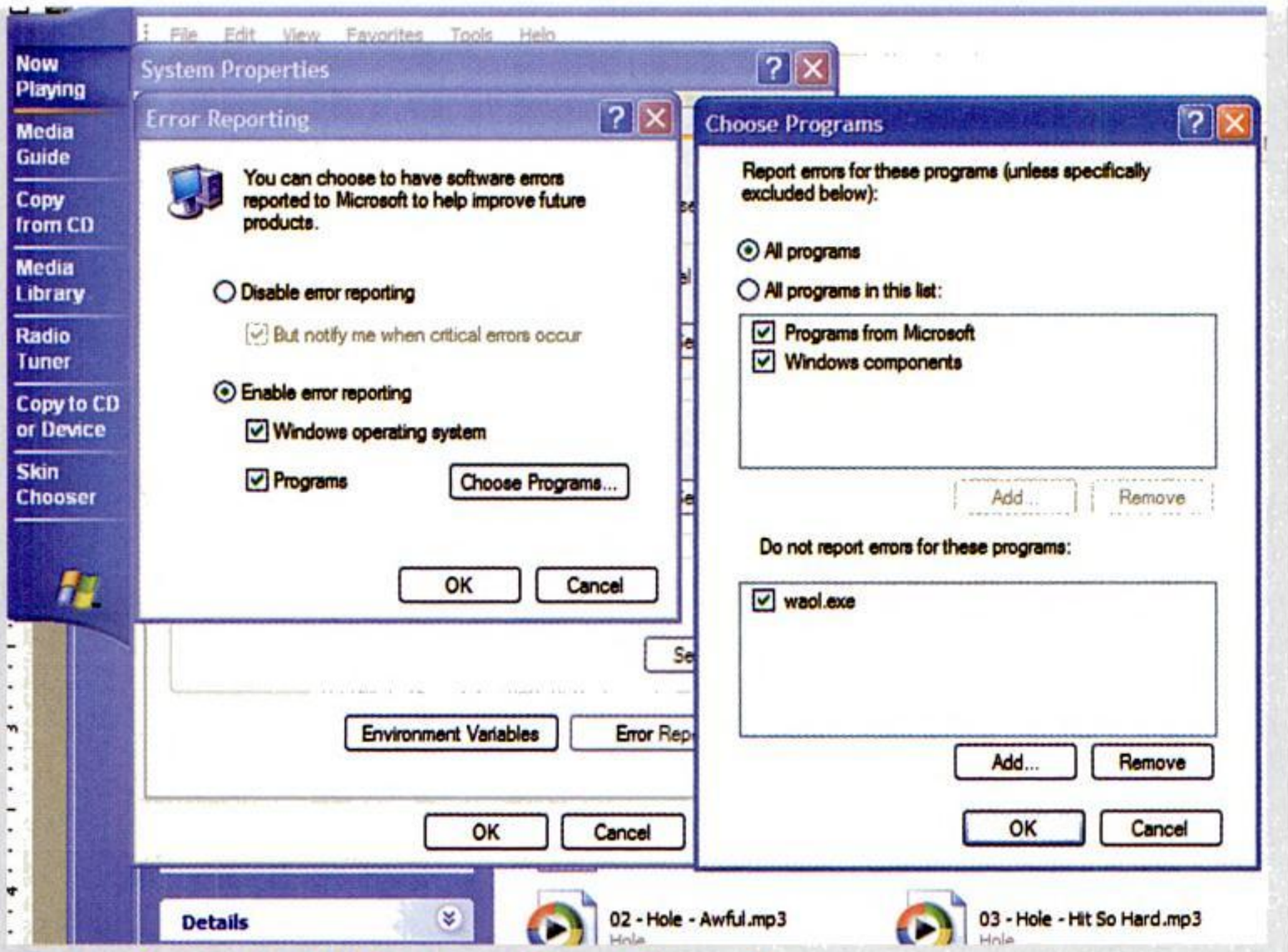
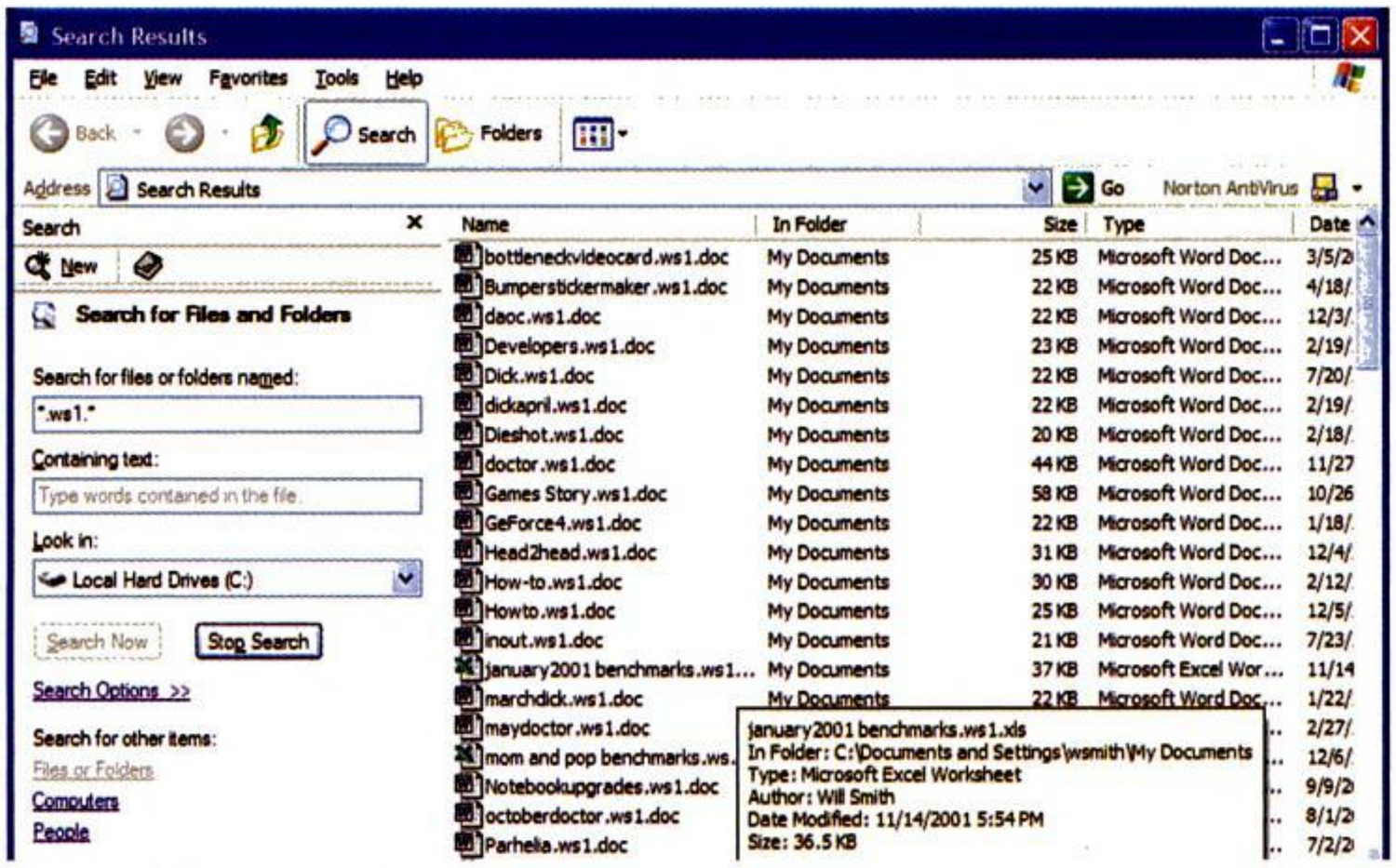


Take Control of Windows Error Reporting

Sure, it's great to help Microsoft track down bugs inside Windows and applications, but when you're in a hurry to print something and an unruly app keeps crashing and generating those annoying error report messages, you don't care about helping Gates and his bully boys. You can turn off error reporting entirely by going to System Properties (Windows key + Pause/Break), clicking the Advanced tab, then clicking the Error Reporting button.

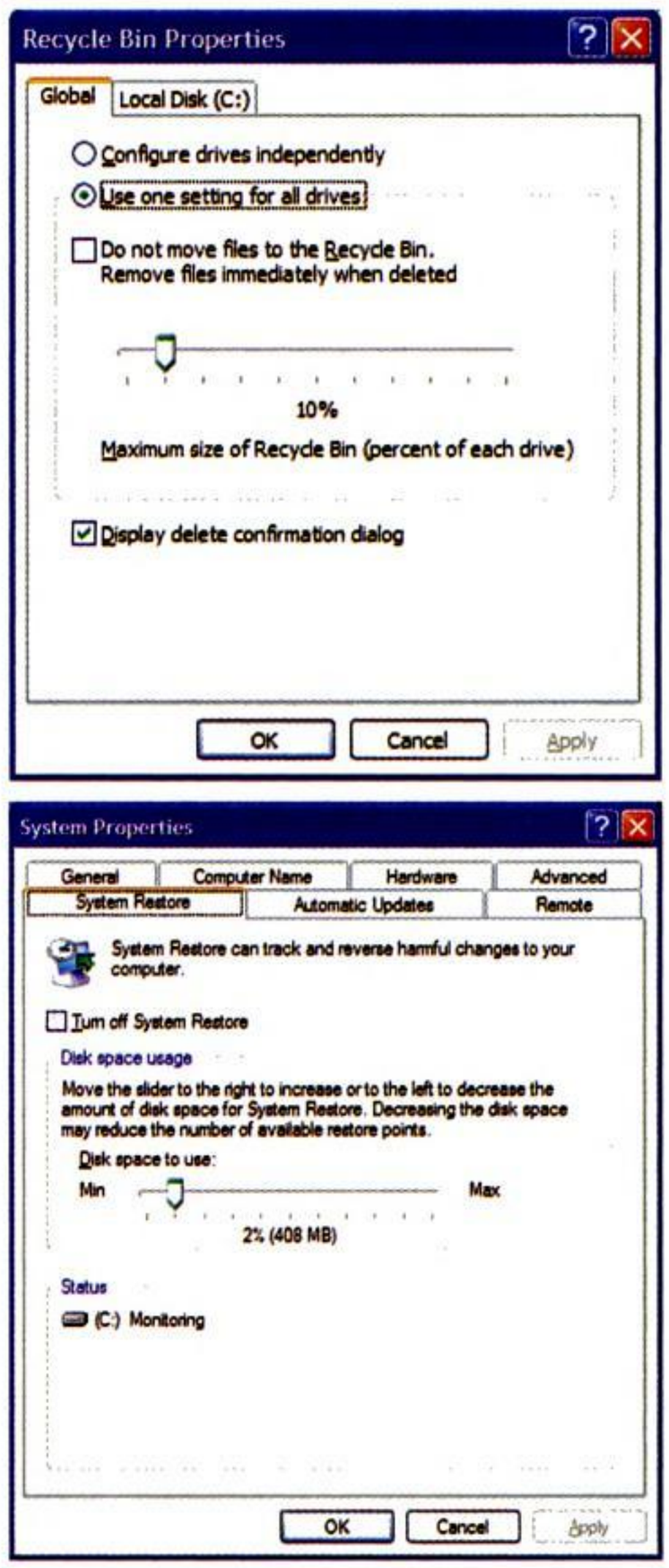
You can either disable error reporting entirely by selecting that option, or you can zoom to the "Choose Programs" screen and specifically choose the apps you want to include or exclude from the annoying error reporting process.



Reject the New, Dumb Search Interface

Do you miss the simplicity of the old Windows 98/2000 Search utility? Does it make you angry that Windows XP dumbed down your search options and gave you an annoying Search mascot? We'll show you how to not only ditch the mascot, but also revert to the original, more powerful search interface.

Open Regedit by going to Start, Run, and typing Regedit in the Open box. Then browse to HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\CabinetState\ and create a new String Value called Use Search Asst which you should set to the value "no".



Rein in System Restore and the Recycle Bin

We really dig System Restore. If you install a driver that hoses your system, System Restore will frequently let you roll your system back to a time before that evil driver tainted it. However, System Restore will eat 2 percent of your disk by default. That's not a big deal if you've got a puny 10GB hard drive, but if you just shelled out for a 180GB monster, 2 percent of that drive is 3.6GB.

To save your drive, open up System Properties again, go to the System Restore tab, and move the slider until you're a little more happy with System Restore's disk space usage.

If you thought System Restore was a disk hog, the Recycle Bin consumes 10 percent of your drive by default. That's a full 18GB on our new monster 180GB drive. To turn down the Recycle Bin's disk usage, right click the Recycle Bin, go to Properties, and move the slider from 10 percent to something a little more compatible with today's massive disks (we wonder when we're going to see a sub-1 percent option). ■

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How To...

MAKE A FEATURE FILM ON YOUR PC

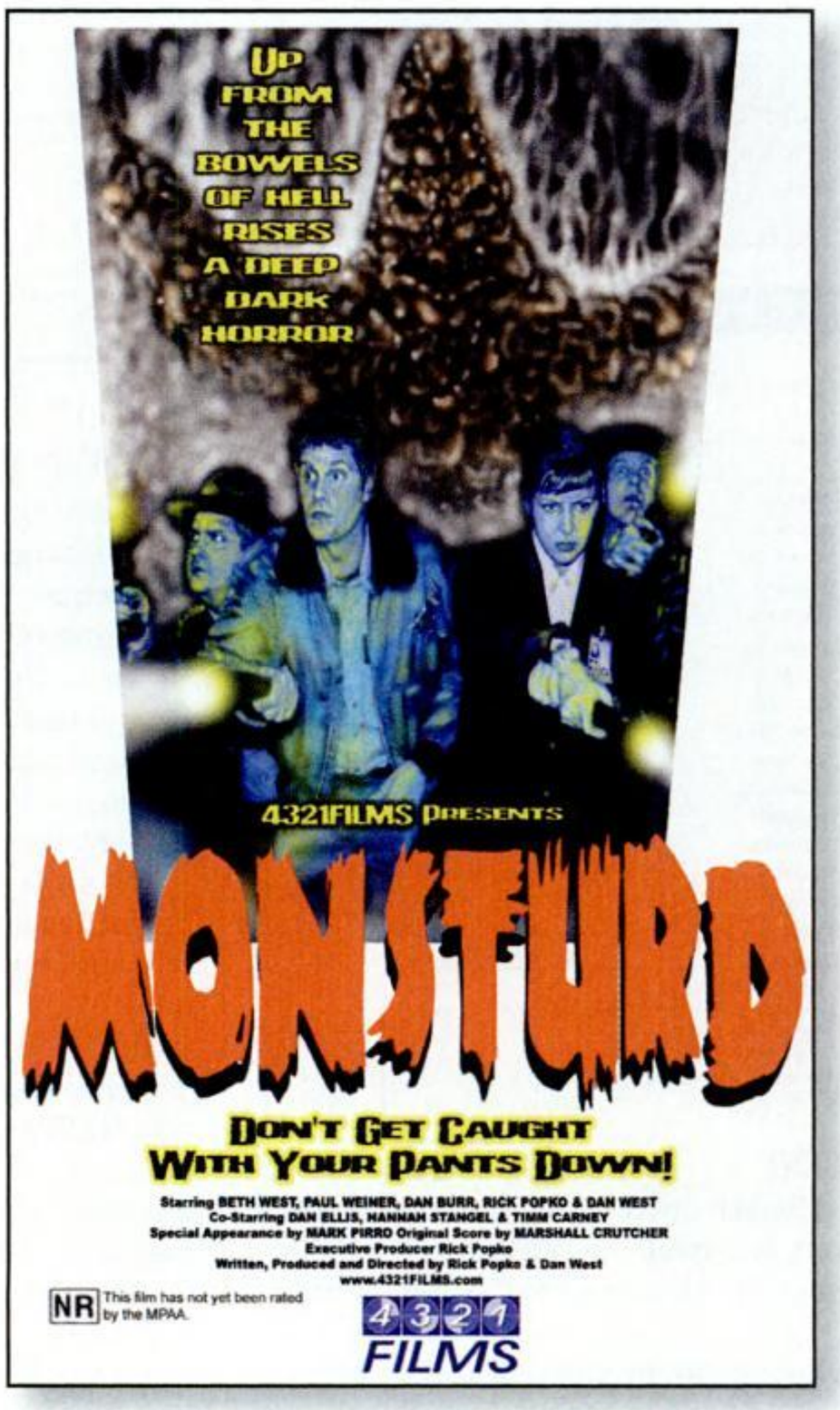
All you need is talent, a good PC, basic DV equipment, and a bunch of willing friends

BY RICK POPKO

MAXIMUMPC
DIFFICULTY RATING
EASY
HARD
XXX

NOTE:

The trailer for the movie described in this article can be found on the CD that came with this magazine. The movie itself can be purchased at **www.4321films.com**.


UP FROM THE BOWELS OF HELL RISES A DEEP DARK HORROR
4321FILMS PRESENTS
MONSTURD
DON'T GET CAUGHT WITH YOUR PANTS DOWN!
Starring BETH WEST, PAUL WEINER, DAN BURR, RICK POPKO & DAN WEST
Co-Starring DAN ELLIS, HANNAH STANGEL & TIMM CARNEY
Special Appearance by MARK PIRRO Original Score by MARSHALL CRUTCHER
Executive Producer Rick Popko
Written, Produced and Directed by Rick Popko & Dan West
www.4321FILMS.com
NR This film has not yet been rated by the MPAA.
4321 FILMS

Rick's film even has a pro-caliber VHS label.

Digital video has evolved to the point where anyone with a decent DV camcorder, a fast computer, a good script, and a handful of friends (who'll act for free) can make a feature film for practically nothing. That's right: A full-length feature film. Don't believe me? Well, I just did it along with my creative partner, Dan West. The movie is called *Monsturd* (yes, it's about what you think it's about!), and we're currently in negotiations with Spectrum Films (**www.spectrumfilms.com**) for both foreign and domestic distribution rights.

Monsturd was shot with Canon's GL-1 DV cam (it can be found for about $2,000), and edited on a 500MHz Micron rig with 250MB RAM (which cost $1,500 two and a half years ago). We used a Pinnacle Systems DV500Plus editing package ($650), which includes the full version of Adobe *Premiere*. Our hard drive was a 7200rpm, 100GB Western Digital ($200). Our production budget (aside from the aforementioned gear) included tape stock, costumes, props, beer, some food, and a one-day cop car rental—all for just about $3,000.

Locations: $0. Actors: $0. Permits: $0. Insurance: $0.

So you see, with the tools at your disposal, you *can* make a movie. Now we're going to walk you through the process...

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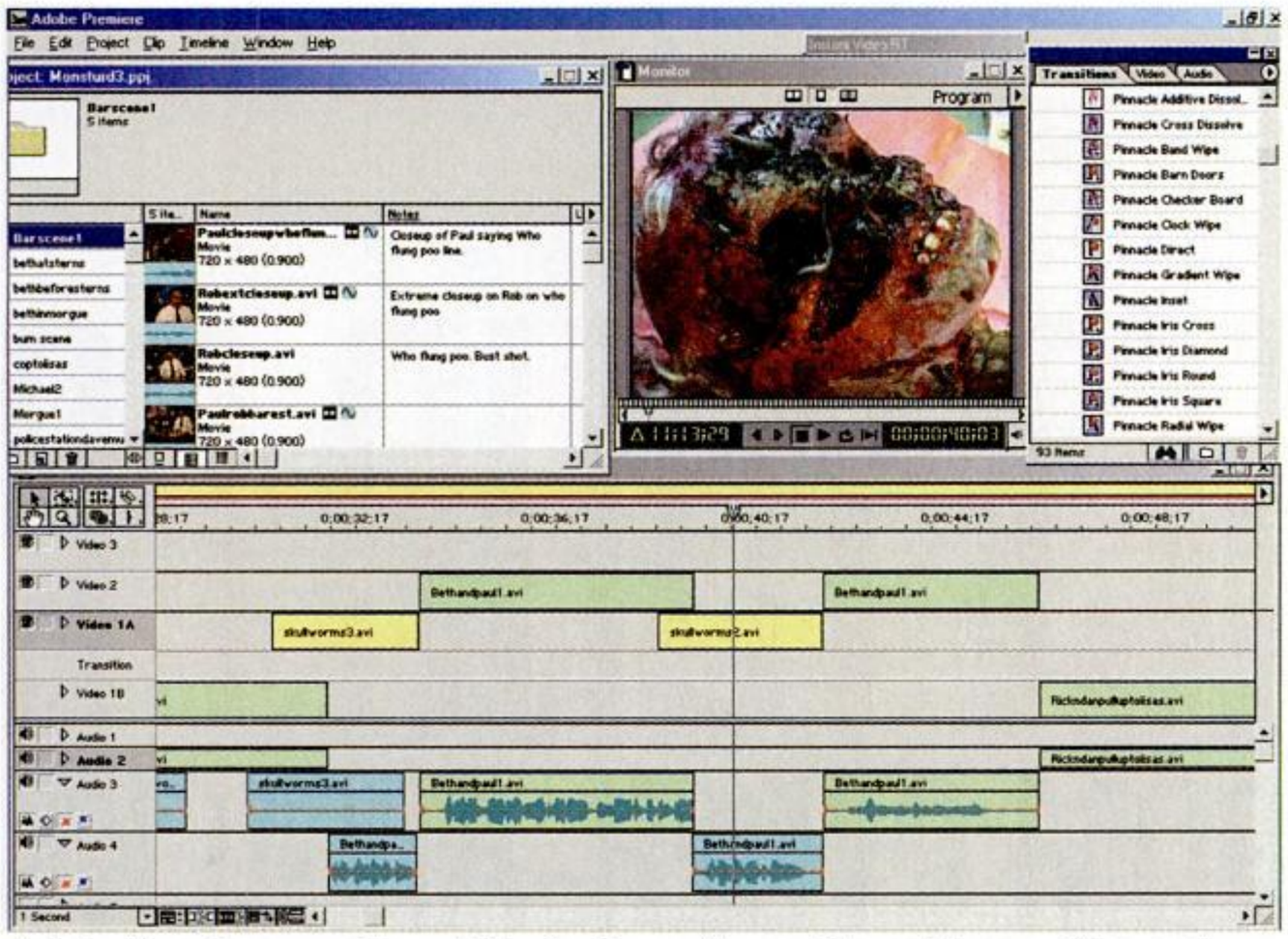

Adobe *Premiere* provides all the tools you'll need to meld your video and audio into a single, cohesive unit. Of course, you'll still need editing talent!

deal if you buy the FireWire card and the editing software together as a bundle. And most video editing software companies offer a free demo/30-day trial version you can download or order as a CD. Read reviews and see what others are saying about the software out there.

LOGGING CLIPS

Before you dump all your raw footage into your hard drive, you're going to want to go through all your tapes and log them. This is where timecode comes into play. Put a DV tape in your camcorder and play the whole thing back from the beginning of the tape. You should have a text doc open to jot down every shot and its time code. If you find a particular shot that you know you'll use, note that as well. After you've logged all your shots you should know where everything is on all of your tapes. You're now ready to capture.

CAPTURING CLIPS

Capturing is the process of recording material from your camcorder to your computer's hard drive. Capture only what you need. DV takes up a ton of hard drive space (3.6MB per second, to be exact). So don't just dump the entire contents of your miniDV tape to your hard drive, or you're going to fill it up fast (and it's a pain in the neck to go back and delete what you don't need).

MUSIC

We investigated how much it would cost to use a song by Sisters of Mercy on a previous film we were making. BMG said it would be $2,500 for the song rights for the first 1,000 or so tapes, then

Yes, this would be the Monsturd.

5 cents for every copy thereafter. That didn't include fees to the band (should they have wanted any) or permission from the band to use the song. Whatever you do, don't steal the music. You'll get a cease-and-desist order and you'll be charged for using the copyrighted song in question. There is a "fair use" clause that lets you use some recorded music legitimately, but there are rules. The song can't play for more than 10 seconds, and it can't be the focal point of the scene (it can be used only as background). You really shouldn't have to pay for music up front anyway. There are thousands of talented musicians and bands who are eager to help out in exchange for a credit, or a cut of the back end. For *Monsturd*, we went with Emmy Award winning composer Marshall Crutcher, who not only scored the film, but also did our audio mix. Marshall was kind enough to work for nothing in exchange for 10 percent of the film's profits. He would normally charge $90,000 for the amount of work he did for us.

BACKUP

Buy an extra 100GB hard drive to back up your project files and video clips. One in 100 hard drives crashes unexpectedly, and Murphy's Law says it's going to be yours. Don't take any chances. We didn't back up our movie until three months after we started editing. Looking back, that was very stupid. If our hard drive had crashed, we would've lost three months of editing and had to start all over again.

Step Five: The Master Copy

Once you've completed all your editing chores (a time-consuming artistic process best left for another story), you should have your entire movie on one timeline. You're now ready to lay master copies to miniDV or DVCAM tape.

If you've shot a feature that's 90 minutes or less, the only way you're going to squeeze it onto a 60-minute tape is to record in EP mode (just remember, if you hit a glitch in the tape, you may lose bits of audio and video). MiniDV can work for your own master tape, but no distributor will accept it. We ended up renting a DVCAM deck from our local photo-supply store for $95 a day, plus tapes. (DVCAM tapes are roughly $30 a piece. They're more robust than miniDV tape stock and come in lengths longer than an hour.) You'll want to make at least three master DVCAM tapes. (You never know when your house might burn down.) It's a good idea to give one of your extra copies to your parents or a trusted friend. Now you're ready to find a distributor! ■

Rick Popko is a former Maximum PC *editor. Since 1985, he's written 10 feature-length screenplays, one of which was co-written with Dan West, and optioned by Francis Coppola. Popko and West are currently working on a feature tentatively titled* The Blockheads in: Mask of the Weenie Wagger. *Rick can be reached at rick@4321films.com.*

RESOURCES

- For filmmaking advice and note-sharing with other budding directors and producers, go to www.b-independent.com and www.indieclub.com.
- For a good book on the subject of low-budget filmmaking, I suggest checking out Mark Pirro's *Ultra Low Budget Movie Making;* see www.pirromount.com for more info.
- The following newsgroups are a good place to learn and ask questions about digital video: news:rec.video.desktop, news:rec.video.production.
- And if you're ready to find a distributor, I recommend checking out the *Hollywood Creative Directory* (www.hcdonline.com). It's $70, but it has the names, addresses, phone numbers, and contacts of 800 distributors around the world.

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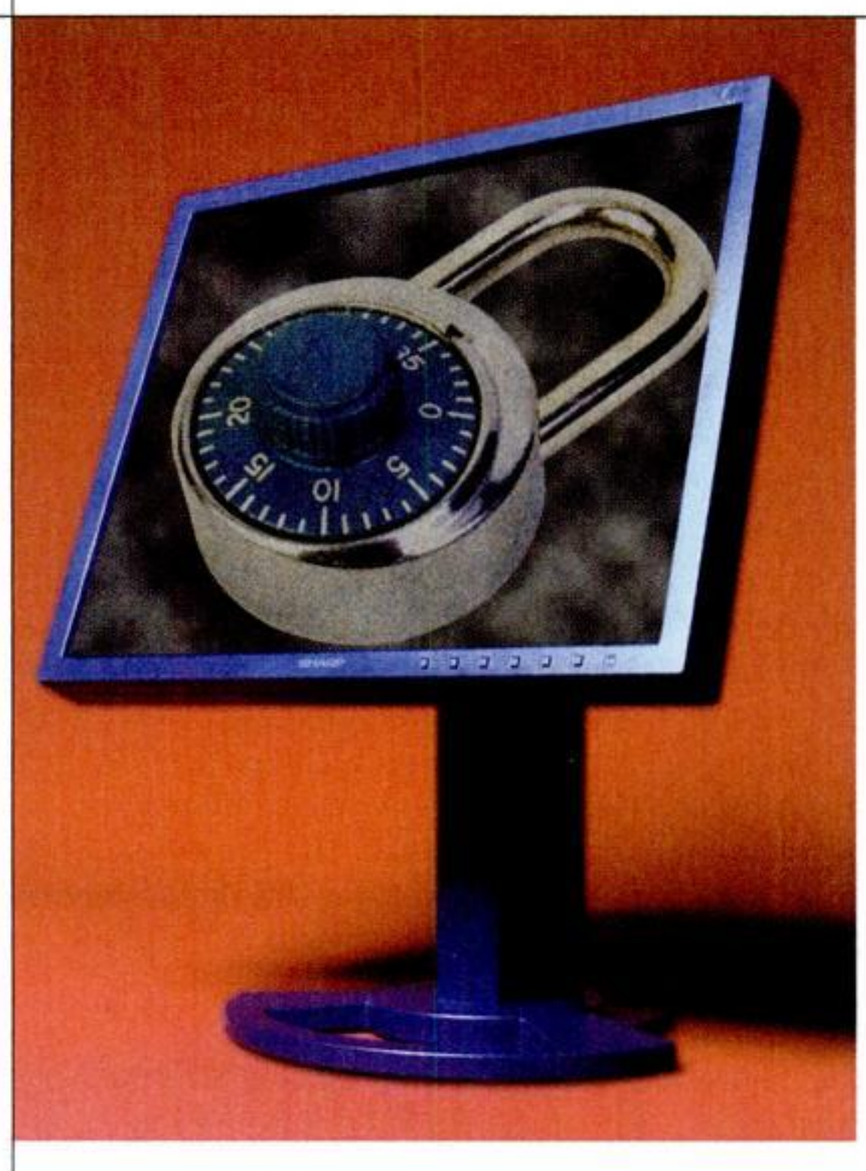
How To...

PROTECT YOUR PC FROM CYBER-ATTACKS

Keep 'sploiters, script kiddies, and crackers from breaking into your machine and taking over the world

MAXIMUMPC
DIFFICULTY RATING
EASY



BY CHRISTIAN "WOLFMANN" LESEMANN

Is your PC part of a massive worldwide conspiracy designed to topple military and commerce web sites? Do you unwittingly contribute to the "denial of service" attacks that constantly plague the Internet? If you don't take some basic preventative measures to protect your PC, then you could be a co-conspirator without even knowing it.

Lucky for you, securing your PC isn't particularly difficult. You just need to know where to get the right utilities and which settings to change. This article will sum up a complete six-step program toward PC security, so follow along, and you just might learn a few new tricks.

You probably already know that your first line of defense is a software firewall, which inspects all the traffic going in and out of your computer, and blocks unauthorized transfers. Your second line of defense is antivirus software, which catches malicious files before they can cause your PC any harm. But PC defense doesn't just begin and end with these two types of utilities. Read on for the whole story on battening down your PC hatches.

And check out the list below for our favorite PC defense apps.

Recommended Software Firewalls:

- **Norton Internet Security 2002, www.norton.com, $70**
- **Zone Alarm, www.zonelabs.com, free (Pro version is $40)**

Recommended Antivirus Software:

- **Panda Platinum Antivirus Titanium, www.pandasoftware.com, $25**
- **Norton Antivirus 2002, www.norton.com, included with Norton Internet Security, $50 separately**

Recommended Ad-Blocking and Diagnostic Software:

- **Ad-Aware, www.lavasoft.de, free trial**
- **AATools, www.glocksoft.com/aatools.htm, free trial**

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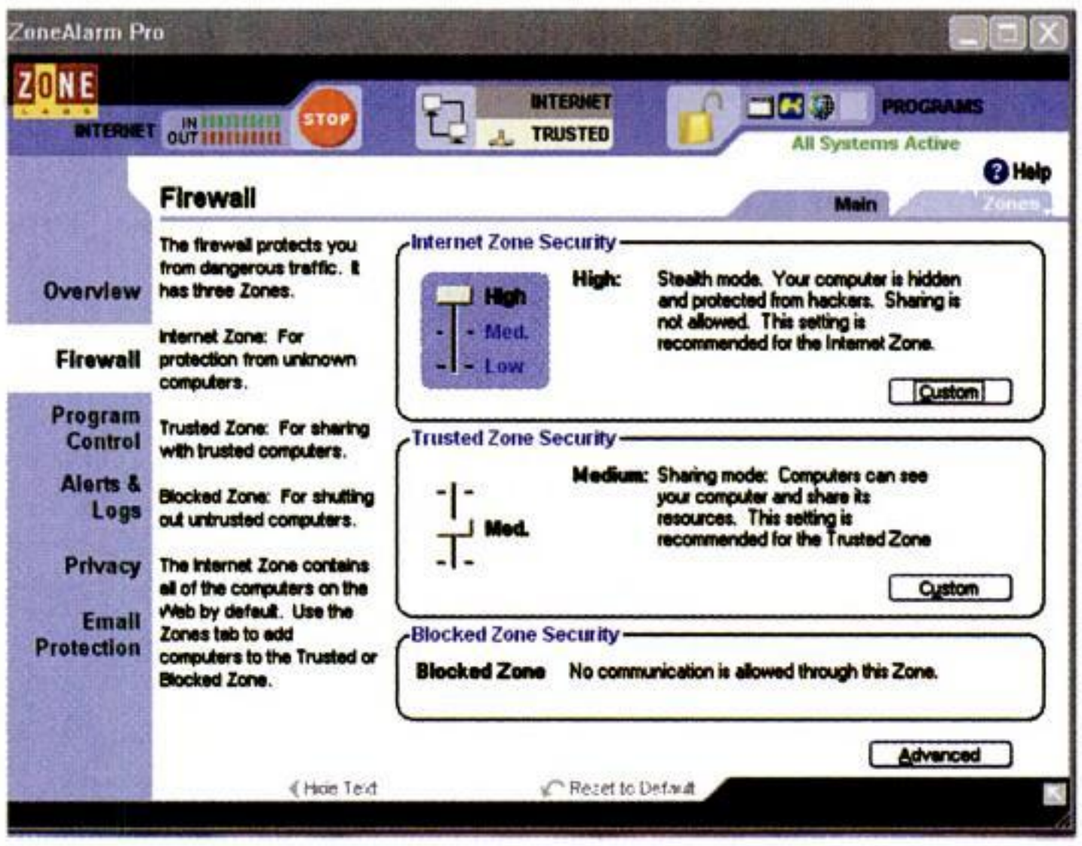
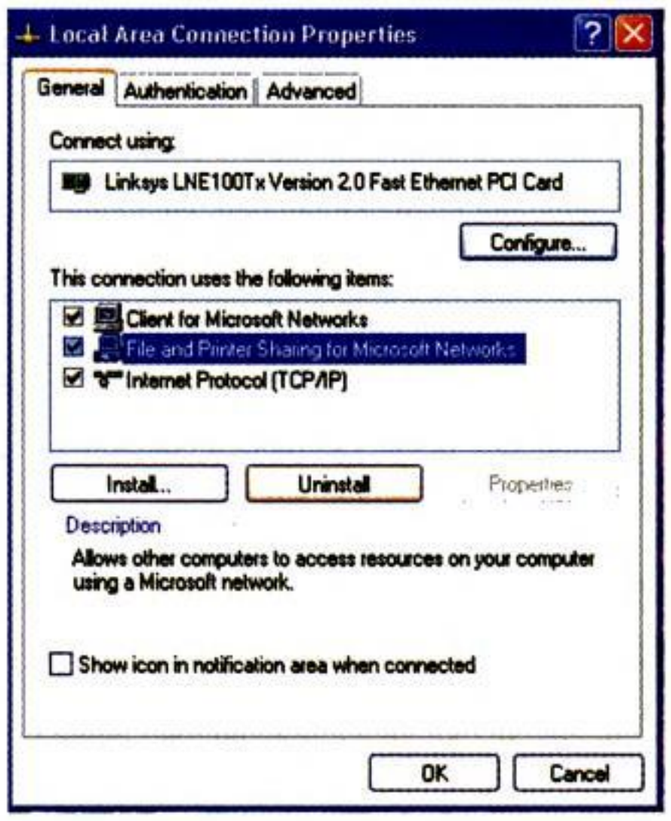
Step 1: Antivirus & Firewall Tactics

Get yourself a good antivirus utility, and make sure to update its profiles on a regular basis (software that can't recognize and kill the latest malicious code is useless!). Most antivirus software scans all new files and programs introduced to your computer, but you should also schedule a weekly scan of your entire hard drive just to be safe.

As for firewalls, you need to remember that default settings will likely allow unfettered Internet access to thousands of apps—so you can't trust a firewall's defaults to protect your PC. Instead, move the security bar to its maximum protection setting.This will almost certainly disable games, peer-to-peer file-sharing apps, and other apps that legitimately need a two-way conduit through your PC, but you'll still be able to enable access on a case-by-case basis. Just don't get into the habit of granting net access to every app because you're sick of seeing the same warning message pop up. Instead, ask yourself if the app should be accessing the Internet. Sure, your e-mail client deserves access, but the new text editor you just downloaded probably doesn't. Be especially wary when an app asks for server access. At first, deny all apps access to the Internet, then if a program doesn't work right, you can always go back and change the setting.

If you have more than one machine sharing your net connection, you have two options. You can either run a firewall on the machine that's directly connected to the Internet, or you can run and maintain the firewall software on each of your machines.


ZoneAlarm Pro
ZONE
INTERNET
STOP
INTERNET
TRUSTED
PROGRAMS
All Systems Active
Help
Firewall
Main
Zones
Overview
Firewall
Program Control
Alerts & Logs
Privacy
Email Protection
The firewall protects you from dangerous traffic. It has three Zones.
Internet Zone: For protection from unknown computers.
Trusted Zone: For sharing with trusted computers.
Blocked Zone: For shutting out untrusted computers.
The Internet Zone contains all of the computers on the Web by default. Use the Zones tab to add computers to the Trusted or Blocked Zone.
Internet Zone Security
High
Med.
Low
High: Stealth mode. Your computer is hidden and protected from hackers. Sharing is not allowed. This setting is recommended for the Internet Zone.
Custom
Trusted Zone Security
Med.
Medium: Sharing mode: Computers can see your computer and share its resources. This setting is recommended for the Trusted Zone
Custom
Blocked Zone Security
Blocked Zone No communication is allowed through this Zone.
Advanced
Hide Text
Reset to Default



Step 2: Keeping Windows Minty Fresh

Keeping Windows fresh is another good defense against evil software. Go to **windowsupdate.microsoft.com** and download all the critical updates for your system. We also recommend installing all Service Packs for Windows and other Microsoft products, especially *Office* (**http://office.microsoft.com**).

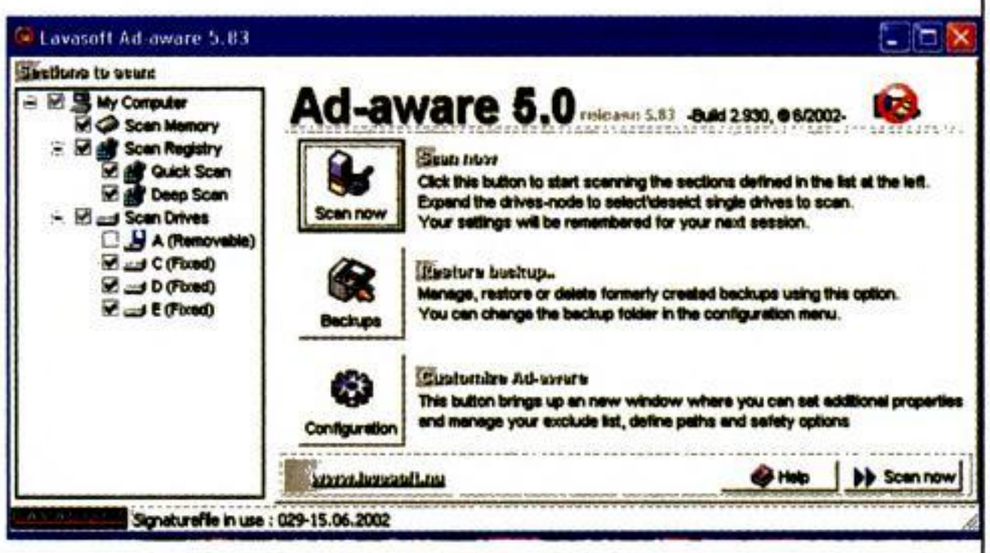
Next you can disable or remove Windows services that you don't use. If you're on a single, non-networked machine, you don't require File and Print Sharing or NetBIOS over TCP/IP. Go to Control Panel, Network Connections, select your adapter, and right click and select Properties. If File and Print Sharing is installed, uninstall it. While you're there, click TCP/IP, go to Properties, then select Advanced and select WINS. Go to bottom and select "Disable NetBIOS over TCP/IP." Even if you have a firewall that blocks NetBIOS ports, you should still disable this function on stand-alone machines exposed to the Internet. With NetBIOS enabled, anyone on the net could have access to all your machine's secrets (OS, CPU and RAM amount, current username, your name, and more) through Port 139.

Step 3: Protect Your Privacy

First off, make sure you're running the latest version of your web browser. You can download *Internet Explorer 6* at **www.windowsupdate.com**, or the latest version of *Netscape* at **www.netscape.com**. Both *IE6* and *Netscape 7* include new features that help protect your privacy. This includes intelligent cookie management and security features that block malicious web sites from installing applications without your consent.

In *IE*, disable nasty third-party cookies by selecting Tools, Internet Options, then Privacy. Go to the Advanced section, and check "Override automatic cookie handling." We recommend accepting first-party cookies, blocking third-party cookies, and allowing session cookies. We've never had problems with legitimate web sites, but this should totally block cookies attached to banner ads (ads that the big banner companies use to track your browsing habits). To do the same in *Netscape*, click Edit, Preferences, Privacy & Security, Cookies, and select "Enable cookies for the originating web site only."

The next thing you should do is install *Ad-Aware*, and run the app. Select all the scan options except for the floppy drive. Click Continue, and it will take anywhere from a couple minutes to 10 minutes to do a thorough scan of your hard drive. When it's done, select the spyware apps it finds and remove them.


Lavasoft Ad-aware 5.83
My Computer
Scan Memory
Scan Registry
Quick Scan
Deep Scan
Scan Drives
A (Removable)
C (Fixed)
D (Fixed)
E (Fixed)
Ad-aware 5.0
Build 2.930, © 6/2002
Scan now
Click this button to start scanning the sections defined in the list at the left.
Expand the drives-node to select/deselct single drives to scan.
Your settings will be remembered for your next session.
Backups
Manage, restore or delete formerly created backups using this option.
You can change the backup folder in the configuration menu.
Configuration
This button brings up an new window where you can set additional properties and manage your exclude list, define paths and safety options
Help
Scan now
Signaturefile in use : 029-15.06.2002

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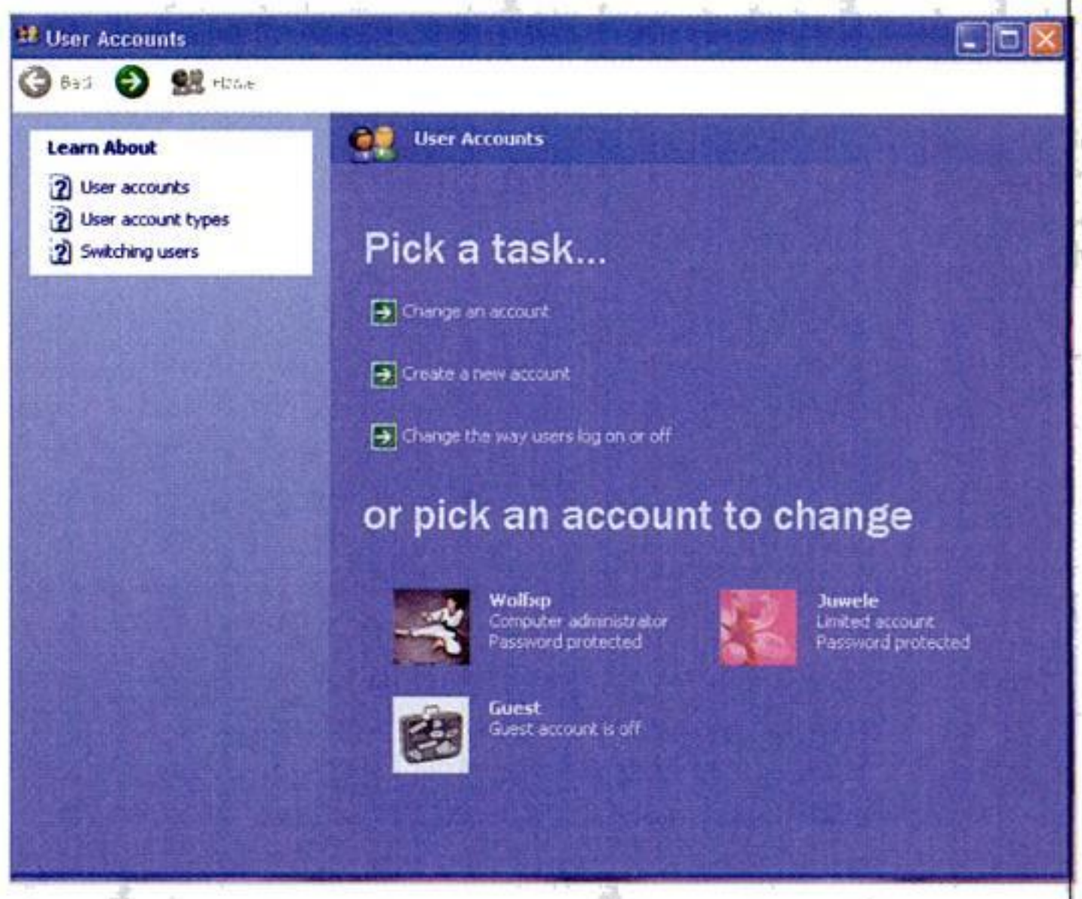
Step 4: Secure Against Console Hacks

To someone trying to break into your PC, your Welcome Screen is a gold mine. It lists all the account names, including the ones with no passwords. Although you've already shut down NetBIOS access to your system (you have, haven't you?), locking down a few items in the User Accounts Control Panel will save you a lot of trouble.

First, go to User Accounts in Control Panel. Make sure the Guest account is disabled. Under the Guest icon, you should see a message saying "Guest account is off." We also recommend that you make all accounts limited access, except for one that'll serve as your Administrator account. Make sure that every account has a password. Now, any schmuck who sits down in front of your PC is locked out of complete access to the machine.

If you want to crank your level of protection up a notch, you can disable the Welcome Screen and Fast User Switching. This isn't necessary for most people, but it does protect your username as well as your password. If your PC is in a public area that lots of people have access to, you may want to go to the User Accounts control panel, select "Change Way Users Log On and Off," and deselect both Fast User Switching, and the Welcome Screen.



Step 5: Security Policies & Disabling Unnecessary Services

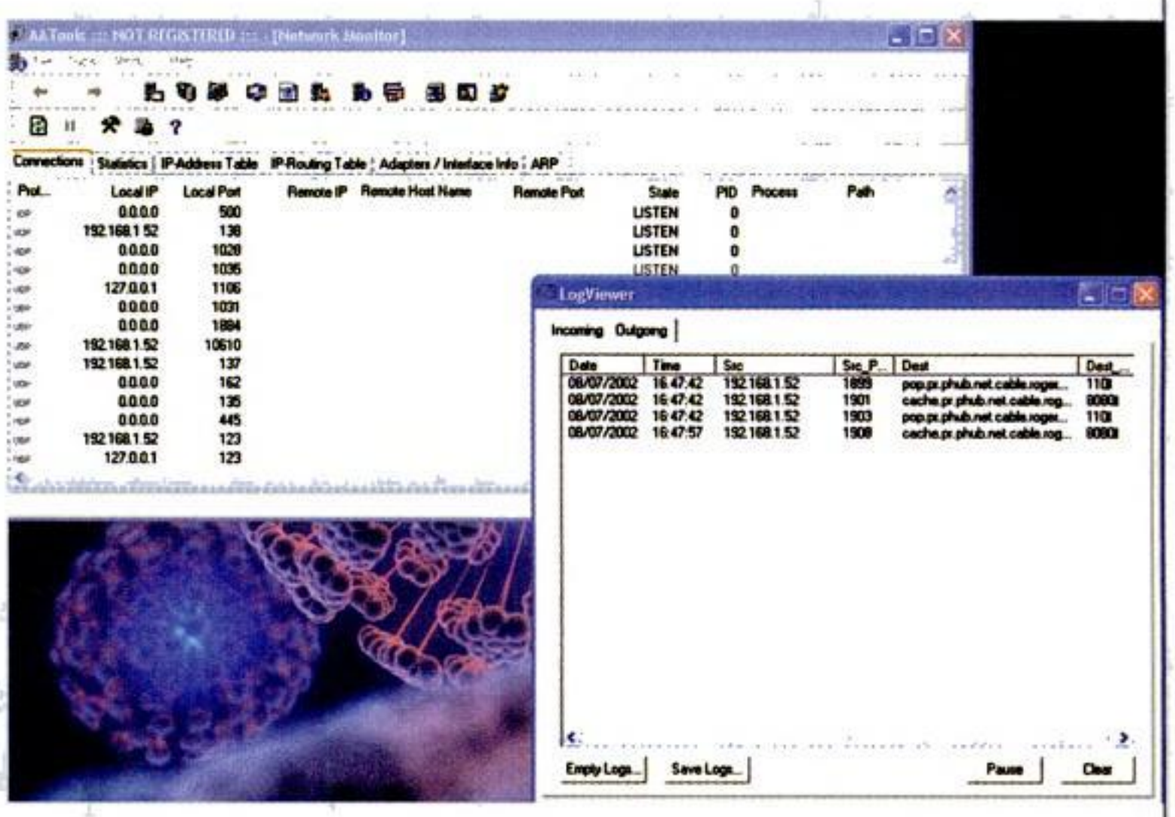
If you think formatting your hard drive with NTFS is all it takes to protect sensitive data, you're sadly mistaken. Should a nefarious evil-doer get his grubby hands on your drive, he doesn't even need your password to access the contents. All he needs to do is install Windows XP in another folder on your hard drive, then he can access every single thing on the drive. So if you really want to make sure your files are secure, encrypt the contents of sensitive folders. All you have to do is right-click a file or folder and select Properties. Then go to General, select Advanced, and select "Encrypt." This will encrypt the file or folder and protect it.

Services make up the central nervous system of WindowsXP and allow all of its components to work together. To tweak your Services, go to Start, then Run and type `services.msc`. You can plug some potentially dangerous holes by disabling a few key services. Remote Access, Remote Registry, and Remote Desktop are handy tools, but most home users will never need them. So scroll down, right click each of these services, go to Properties, and select Disable. All COM+ services and dependencies can be disabled also. Disabling services will also free up memory and system resources.

Step 6: Networking Monitor and Log Viewing

Advanced Administrative Tools may not be cheap, but it's a powerful suite of tools, and includes a free trial if you're unsure about shelling out $50. First you'll need to install *Advanced Administrative Tools* and run the application. The Network Monitor app will show local network information, including all connections to and from the computer. Your PC's internal IP is 127.0.0.1 and isn't accessible by any other machine on the net. Right click any of the other IP addresses to run a WHOIS or a Traceroute. *AATools* lets you see exactly who is connected to, and who is trying to connect to, your PC.

One of the side effects of all this new software you've installed will be a bunch of log files. These logs contain all sorts of interesting information, including the viruses that have been found on your PC, network connection statistics, and even things like the cookies that are blocked. Basically just dig around in the options for your apps and find where they store logs. Then open the log file in Notepad. For network traffic reports especially, check the source IP, destination IPs, and respective ports for outgoing and inbound communications. Inbound traffic from the server that hosts your web page isn't suspicious, but a large number of unsolicited requests on port 6666 from a small site in Siberia could be construed as odd. ■



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Music or video. Photos or data. Satisfy your creative urges
with our discs, burners, players and accessories.

imation

indulge your creative spirits.

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How To...

CREATE A 3D MODEL

Let's use the free version of 3ds max to create a futuristic police cruiser

BY FRED RUFF AND PAUL PERREAULT

MAXIMUMPC

DIFFICULTY RATING

EASY

HARD

XXX

NOTE:

Before starting this how-to, consult your software's help file for basic info.

If you play PC games, chances are you've heard about "mods." A game mod is nothing other than a partial or complete modification of a shipping game. It can include new textures, new models, new maps, new gameplay elements, and even a new theme. A game "modder" may edit or add new content, change the behavior of in-game objects, or both. Mods play a huge role in several PC game genres, and many titles are designed with modding in mind. Game mods are fun to create, and give people much more bang for their gaming buck.

Game developers and publishers have taken note of the modding trend, and now many new titles ship with some form of game editor bundled in. More often than not, these editors give gamers the power to create unique, playable environments (for example, users can rearrange game content, and script unique interactions between characters). *Dungeon Siege* and *Neverwinter Nights* are two recent examples of very modifiable games.

Last year Discreet released *gmax*, a consumer-level design- and content-editing app based on *3ds max* (a pro-level application used by many game developers). The only differences between gmax and *3ds max* are price (*gmax* is free), and the fact that *gmax* lacks a renderer, which will prevent you from creating movies. There are several "*gmax* ready" games available that will let you use gmax to add new content. You can download your own copy of *gmax* from **www.discreet.com/products/gmax**, or grab it from the CD that came with this magazine.

Creating a game-ready model with *gmax* is a perfect way to get your feet wet if you want to give the world of game modding a try. Just be aware that this how-to will make no sense whatsoever unless you have *gmax* up and running. The instructions might seem difficult at first, but if you follow along, you'll soon be a *gmax* master.

In just 29 steps you can have a slick 3D model like this one.

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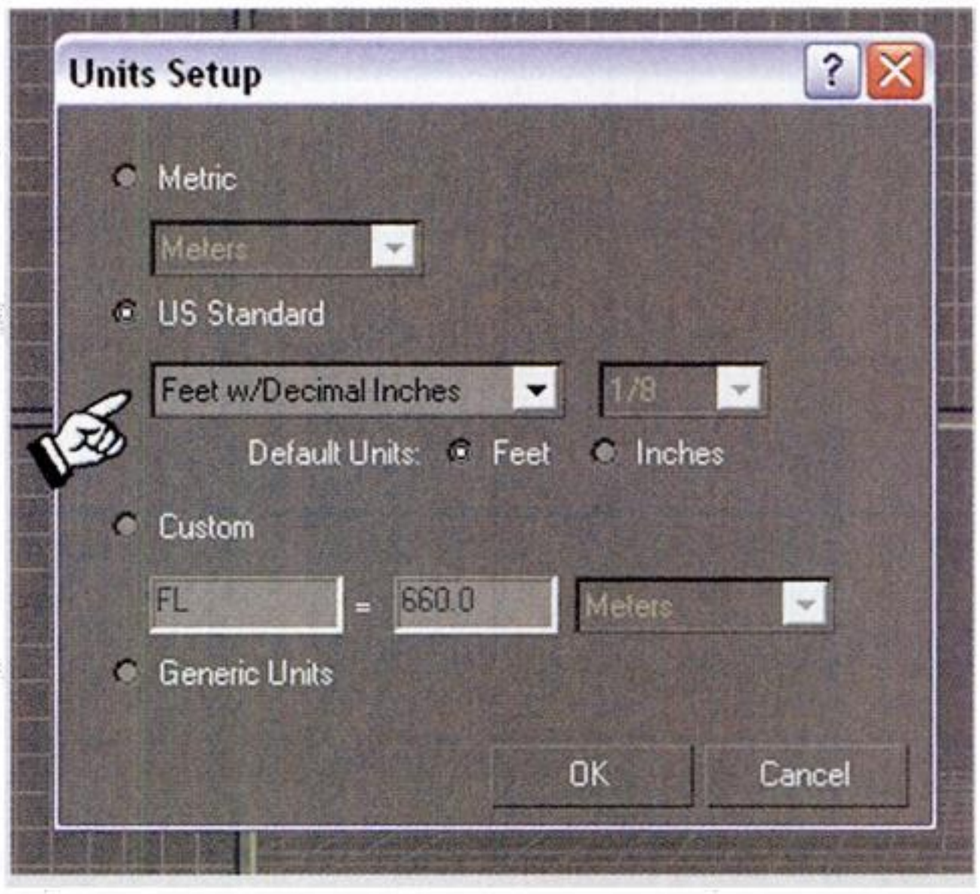
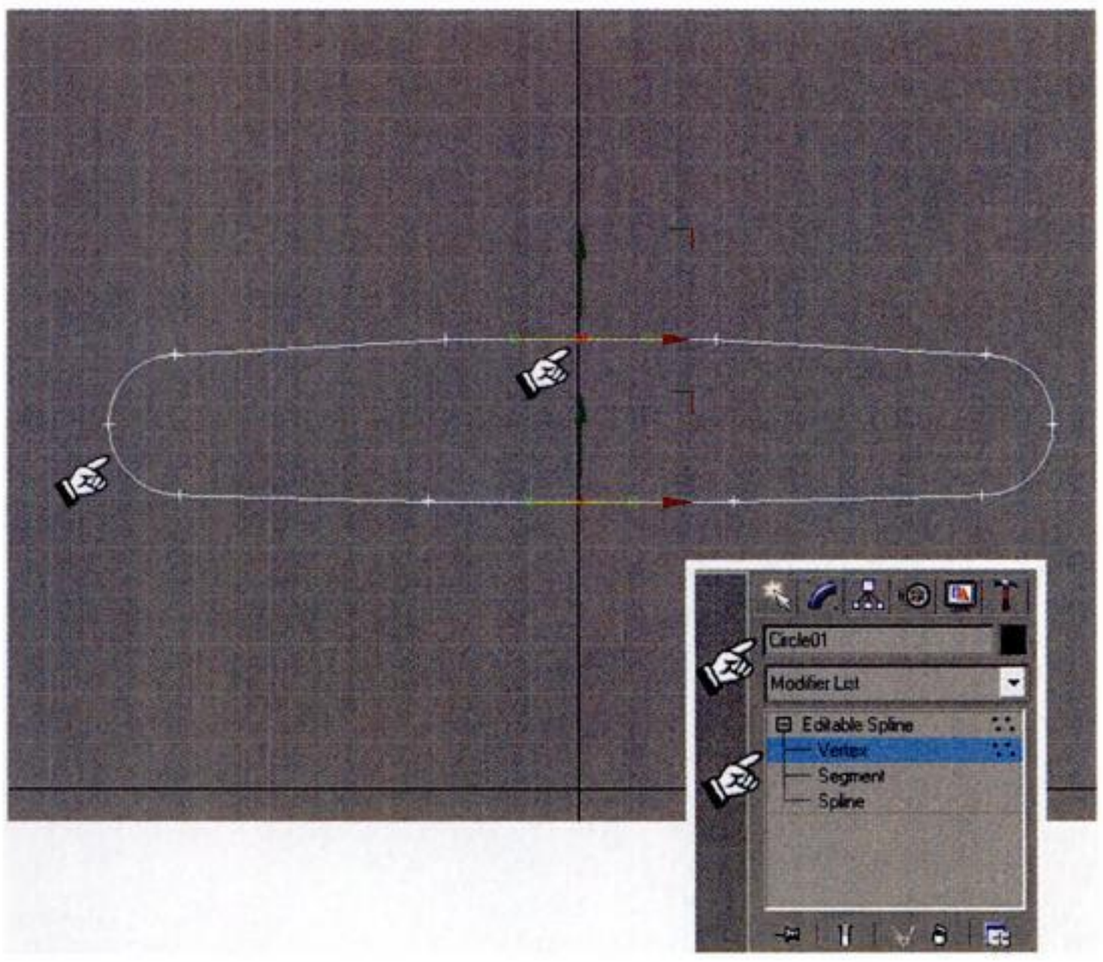
Step 1: Units

First fire up *gmax*. Before we do anything, we'll need to pick a scale to work in. We don't want to create a police cruiser that's as big as a house, or as small as a toy. We want our cruiser to comfortably accommodate two 6-foot individuals.

The default scale for gmax is a generic integer system, but let's switch it to feet and inches so we can get an idea of our scale. Go to Customize>Units Setup, and change the units to feet with decimal inches (see image). Activate the perspective view port by clicking in it. Now go to the command panel, Create>Geometry>Standard Primitives>Box and draw out a parametric box primitive that's 2-feet wide by 2-feet long by 6-feet in height. (Tip: Click on the Keyboard Entry rollout and enter values for length, width, and height).

Think of the box as a reference object representing a 6-foot-tall man. When you're roughing out your cruiser model, you can put this box next to it to imagine your model in context. Feel free to delete, freeze, or hide the box once you're happy with the scale of your model.





Step 2: Drawing out the Cruiser's Hull

We like using Patch Surfaces: Using patches allows you to create a smooth surface and provides features to interactively up-res and down-res the mesh. In any active view port, you can change to Front view by pressing F. Once you've done this, press the W key—this toggles full-screen mode.

Create a Circle shape with a radius of 2.5 to 3 feet. Collapse the primitive to an Editable Spline by right clicking the circle (this brings up the Quad Menu) and selecting Convert To...Editable Spline. Now delete one half of the circle: Click the Modify panel and click the Segment sub-object mode. Select and delete two segments, which will result in the creation of an arc. From there, use the Create Line command to draw out the other lines using the vertical origin line as an imaginary mirror plane.

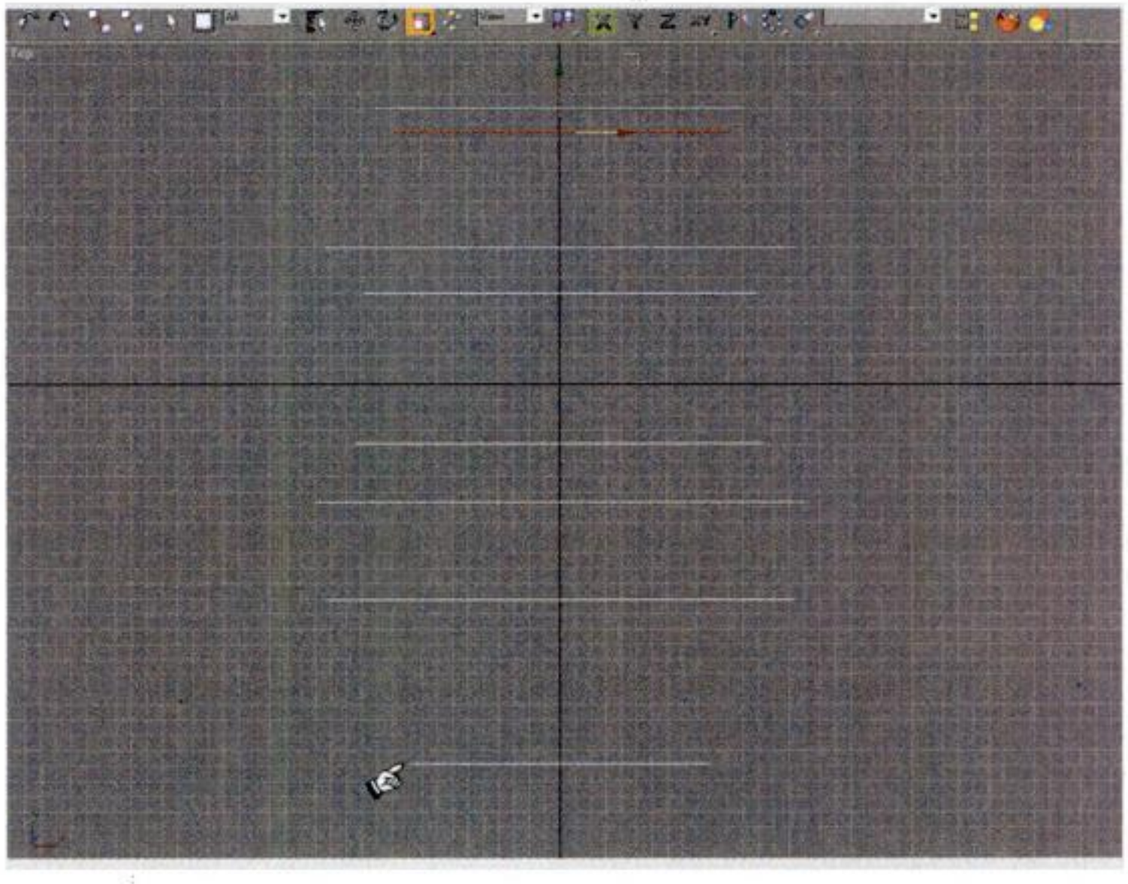
Now use the Mirror command within Editable Spline to make a second copy of the spline: Select the Spline sub-object mode, select the spline, find the Mirror button, and make sure to click the Copy checkbox. Click the Mirror button, then drag the mirrored copy into place. Choose "Yes" when *gmax* asks to weld the endpoints.

Step 3: Laying Out the Surface Splines

Now we'll take the hull shape and make several copies of it, scaling each to create something like the shapes in the screenshot (the shapes look like straight lines because we're viewing them in Top view). Click the Hierarchy tab, and click the Affect Pivot Only button. Now click the Center To Object button, then click the Affect Pivot Only button to complete the operation.

Be sure to save your work frequently!

Click the shape to make it active. Now hold down the Shift key, and click and hold the Y-axis manipulator. Drag upward (along the Y-axis) a few units, then release the mouse button. This action will pop up the Clone Options dialog window. Enter 7 in the Number of Copies field, click the Copy radio button, then hit OK. This procedure will create 8 shapes. Scale each line shape using the Scale tool on the main toolbar. The result should look like our screenshot.



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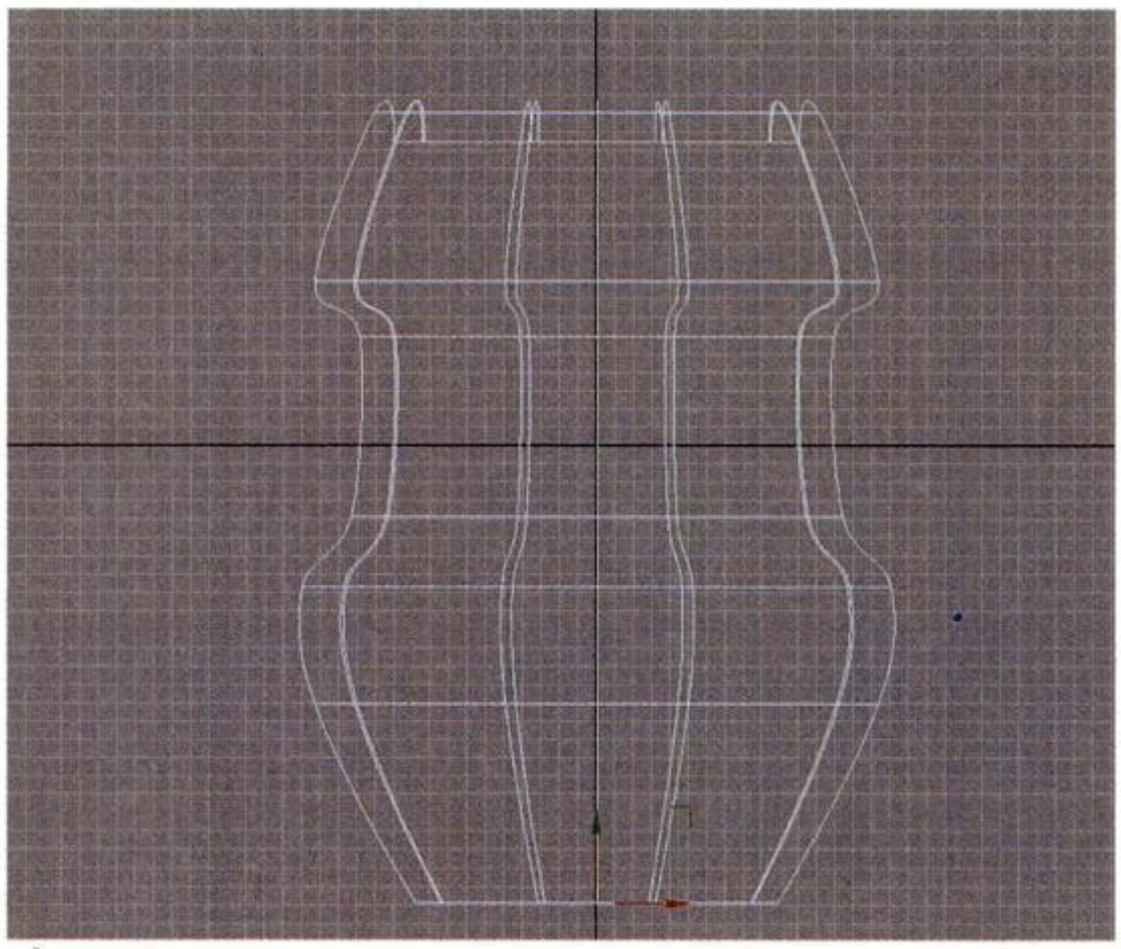
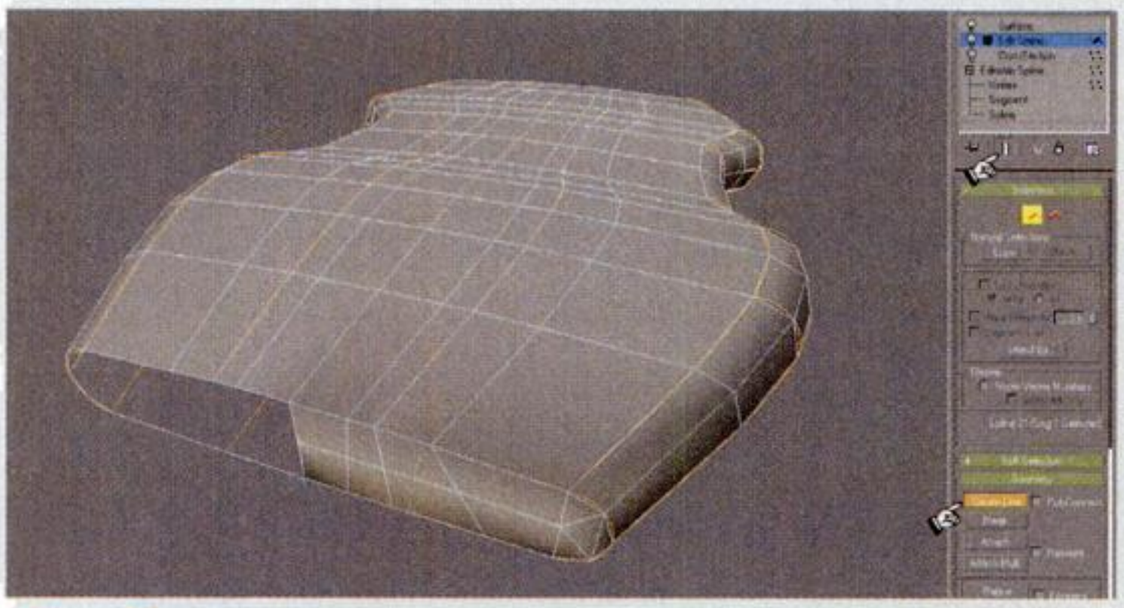


Step 4: Making the Cross Sections

Before we attempt to make the cross sections to complete the spline surface, we'll need to attach all the splines together in the proper order. When we attach the splines we should start from the bottom of the screen (with the original shape) and work our way up. Just don't attach the last two splines; we will attach the last two splines out of order. This will cause the surface to wrap back in on itself creating a nice rear engine area. The order should be: 1, 2, 3, 4, 5, 6, 8, 7.

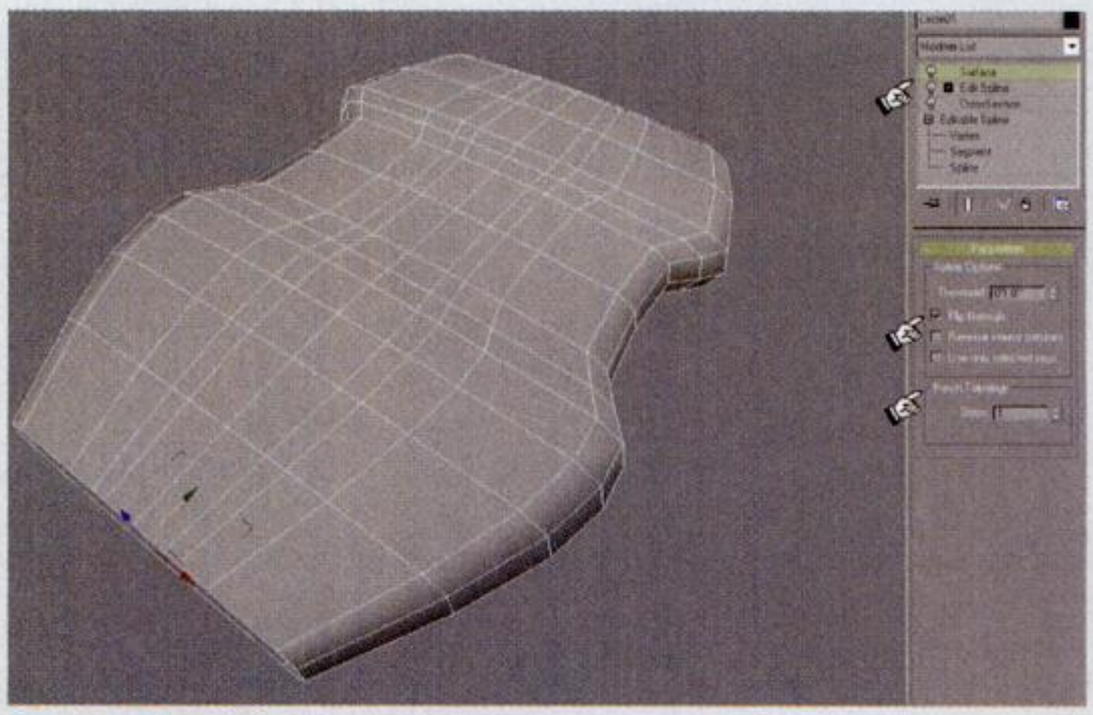
Do this now: Click the spline at the bottom, go to the Modify panel and click the Attach button. Now click each spline object to attach it to the "root" spline (remember the order for the last two splines). With the resulting shape selected, go to the Modify panel, and apply the Cross Section modifier. If the option for Smooth is not chosen, click it.



Step 6: Capping the Surface

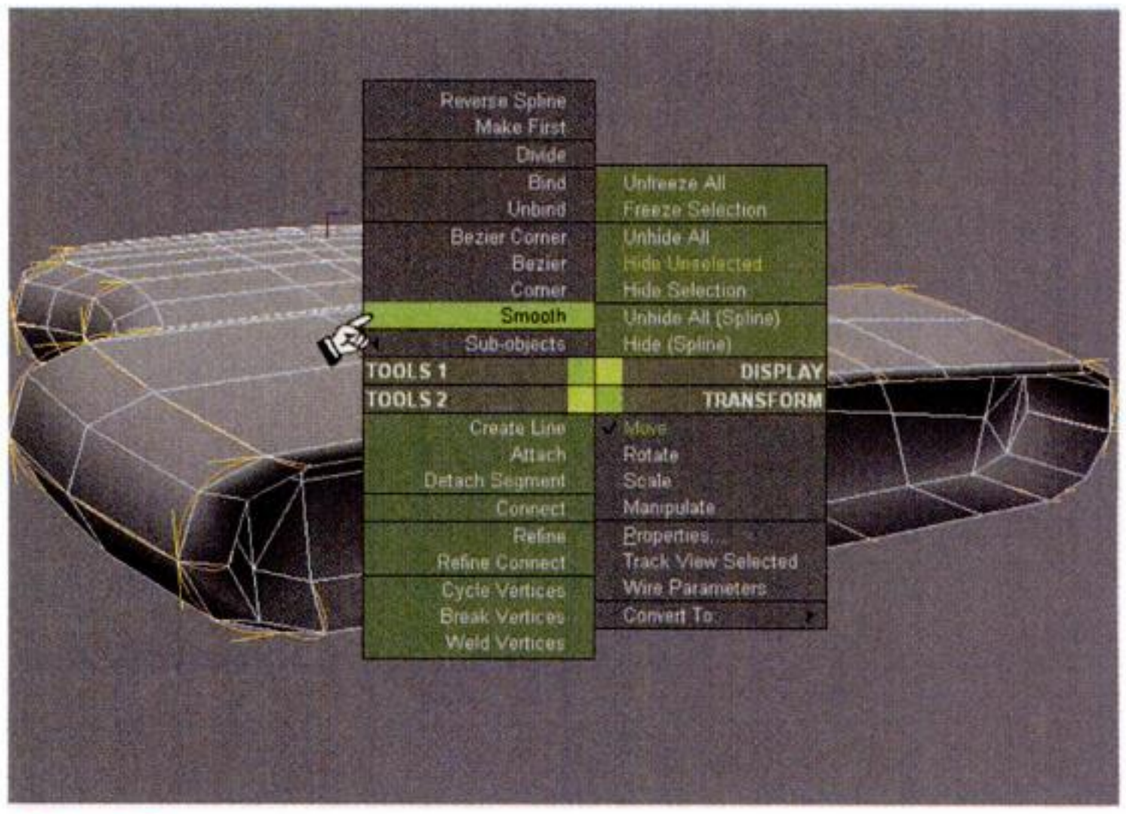
Select the surface and click the Edit Spline modifier in the Modify Panel. Now turn on Show End Result (the small "pipe" icon below the Stack View area). Enabling this feature will allow you to see the full effects of the modifier stack. Go into Vertex mode within Edit Spline. Look for the PolyConnect checkbox and uncheck it. Look for the 3D Snap icon at the bottom of the *gmax* interface (this looks like a magnet with a 3 next to it). Turn it on, then right click the button to bring up the snap options dialog box. Select Vertex and deselect Grid Points.

Close the dialog box and click Create Line in the Modify panel. When you mouse over the splines, you should see a blue cross at each of the vertex locations. On the front and back of the vehicle, connect the six top and bottom vertices. For example, click the top middle vertex then the bottom middle vertex. Right click anywhere in the scene (this ends the Create Line mode). If the surface flips "inside out," adjust the Flip Normals option in the Surface modifier.



Step 5: Making the Surface

Before applying the Surface modifier, apply an Edit Spline modifier so we can cap the sides, but not the ends, of the surface. Now apply the Surface modifier so we can see the result with uncapped ends. Press F3 to toggle between Wire Frame and Smooth + Highlights in the view port. Since we want a nice balance of polygons and performance, we'll turn the Patch Topology Steps to 1. At this point, the surface might look "inside out." You can turn on Flip Normals to fix the problem, but later, it might flip back the other way, so if it does, come back here and turn it on and off as needed.



Step 7: Tweaking the Surface

Once your caps are created, you might notice that the polygon edges are not straight. To fix this, enter Vertex sub-object mode, select all vertices within the Edit Spline modifier, then right click over one of the vertices to bring up the Quad Menu. Choose the Smooth option in the upper left hand Quad. This will smooth the spline handles creating a smoother surface.

If you want to adjust the overall surface, now is a good time to do so. To move or scale a cross section, enter Spline sub-object mode in the base Editable Spline object and select the spline shape you want to transform. Your surface should update showing you immediate results. (Remember: The S key toggles 3D Snaps on and off). Now collapse the object to an Editable Mesh: Select the Surface modifier at the top of the Modifier Stack and right click—select Collapse All. This Patch modeling technique is an extremely powerful approach for most modeling jobs. If you want to be really crazy, you could add another Edit Mesh modifier on top of the Surface modifier to retain the modifier stack. This would allow you to retain full control over every aspect of your procedural model.

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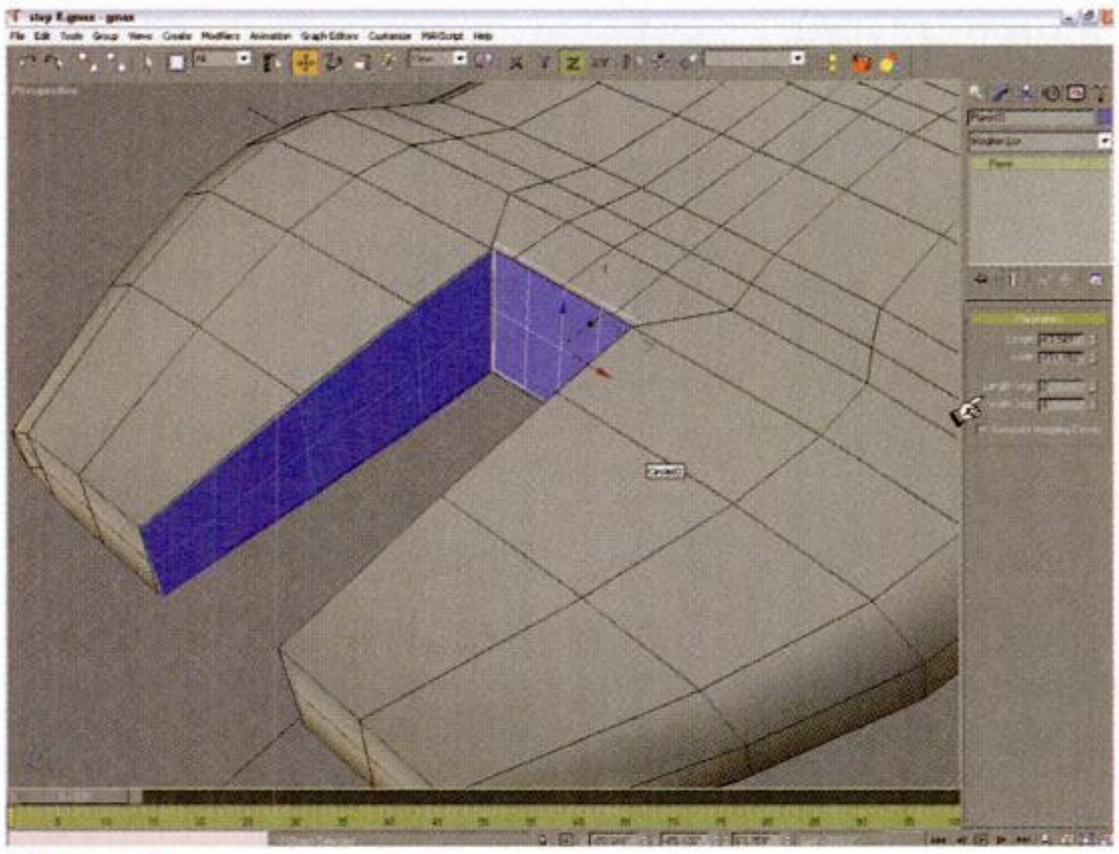
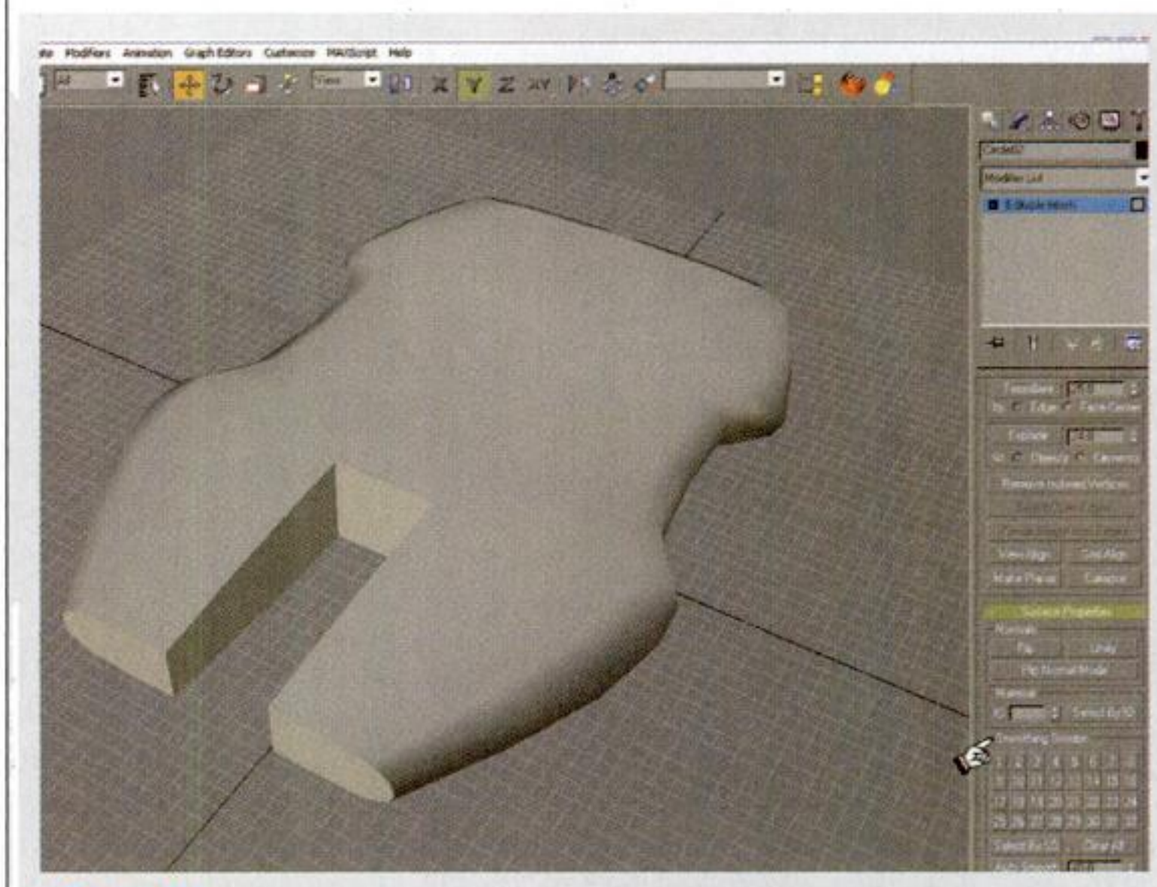


Step 8: Making the Front

Now, we'll delete faces on the surface of the ship, then weld multiple Plane objects back into place. In the Top view port, select a group of polygons (Face sub-object mode) on the front section and delete them. This will create the two "prongs" of the ship.

Now create three Plane objects (Create>Geometry>Plane) for the cutaway interior. The front facing panel will need to be 2 Length Segments x 4 Width Segments (you can adjust these parameters in the Plane Length and Width parameters), and the side planes will need to be 3x2 segments. This will give us a matching number of vertices on the model.

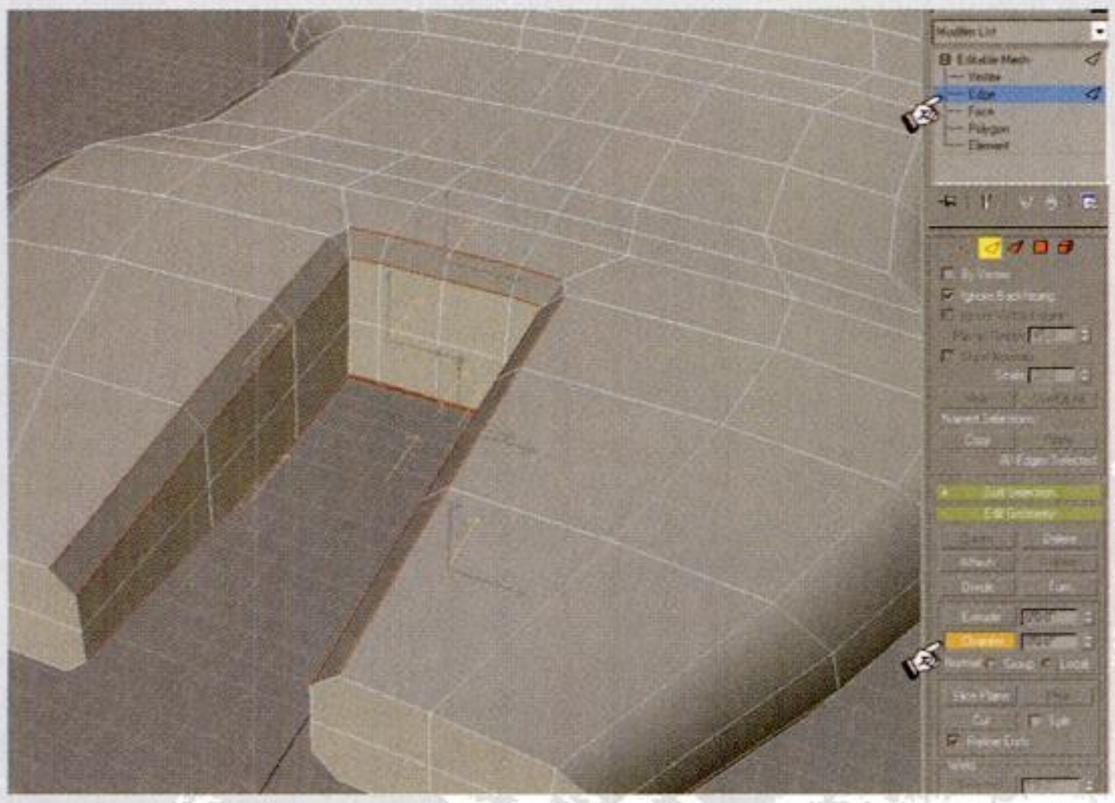
After the three Plane objects are roughly in place, select the Editable Mesh object, then use the Attach command to attach the Plane objects. Use Move and Scale tools to adjust the Plane objects while keeping them nice and flat. Once all the vertices are lined up, select all vertices and set your Weld Threshold to 1.0. Then press Weld Selected. If your vertices don't weld properly, increase the Weld Threshold or manually tweak the positions of the vertices that don't look right.



Step 9: Smoothing

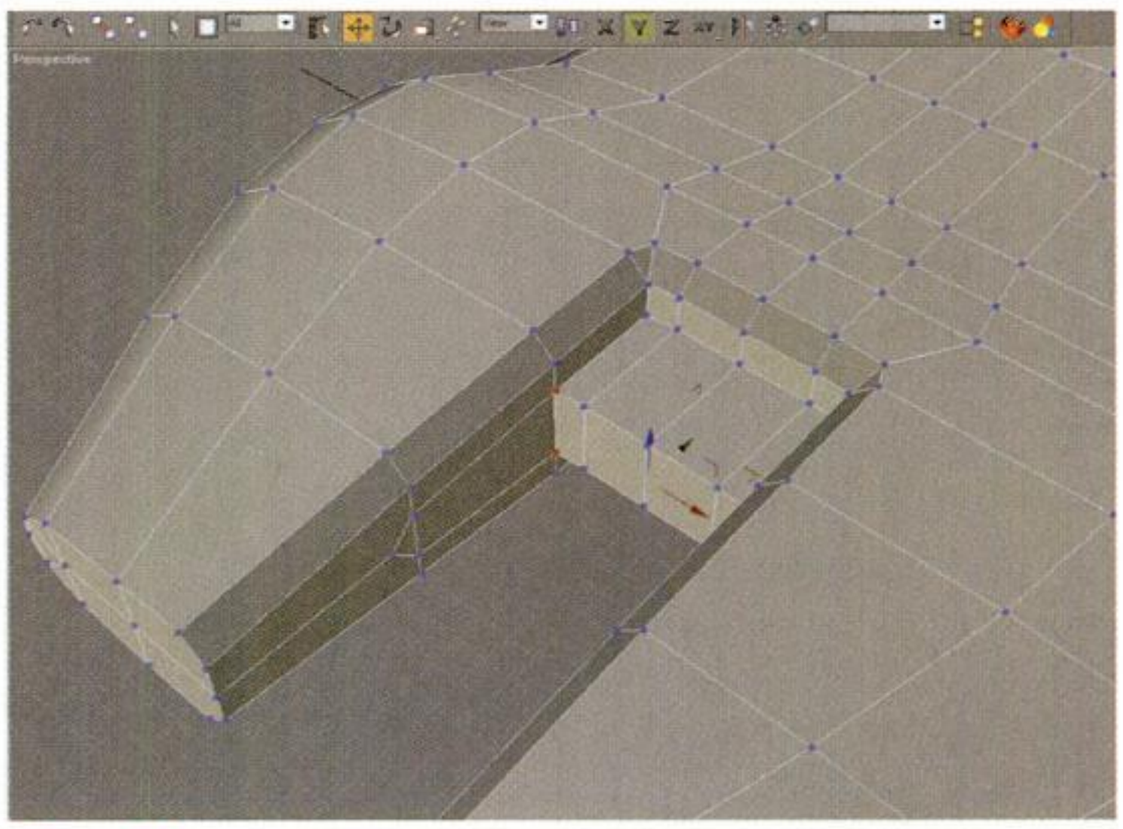
Once we've welded all the vertices in place, the surface smoothing may look strange—like it's trying to smooth an edge without enough polygons. Let's fix that. Turn on the selection option called Ignore Visible Faces. This will select all polygons that are within a preset (45-degree) angle. Now pick one face on one of the Planes that you welded into place. It should select the whole flat area.

Go to the bottom of the Command Panel, and you should see a list of buttons with a matrix of numbers. These are your Smoothing Groups. When two polygons have the same group, they will look smooth. Change each of the planes to have different smoothing group numbers. Once you've figured that out, do that same for the front vents and the rear engine. (Don't forget to turn off the Ignore Visible Edges option when you're done).



Step 10: Chamfering

The Chamfer tool is not only great for smoothing sharp edges, it can also act like a refinement tool, creating a polygon where an edge once was. First, make a nice chamfered edge around the front rim of the prongs: Select all the edges on the top and bottom of the front rim, and use the Chamfer tool to create a chamfer edge. Next, we want to extrude out some detail in the front wall we added. We want to extrude out a poly right in the middle, so let's chamfer the middle edge, leaving a new center strip for us to extrude. Select the edges on the back wall including two edges along each side and chamfer those to make a new strip of polygons for extruding.



Step 11: Extruding

To create the details in the front, we'll use the Extrude tool, but we'll have to delete faces ahead of time to ensure that we don't end up with two faces next to each other that are never seen. The first faces to delete are on each side of the front wall we created. We'll be extruding the middle row of polygons, so go ahead and delete the two polygons on the side walls of the prongs. Next, select the back row of four faces and Extrude them out so they cover the holes you created on the side. The Extrude tool can be accessed via the Quad Menu (right-click the selected face). Finally, select all the close vertices and Weld them together. (Remember you can increase the Weld Threshold if necessary).

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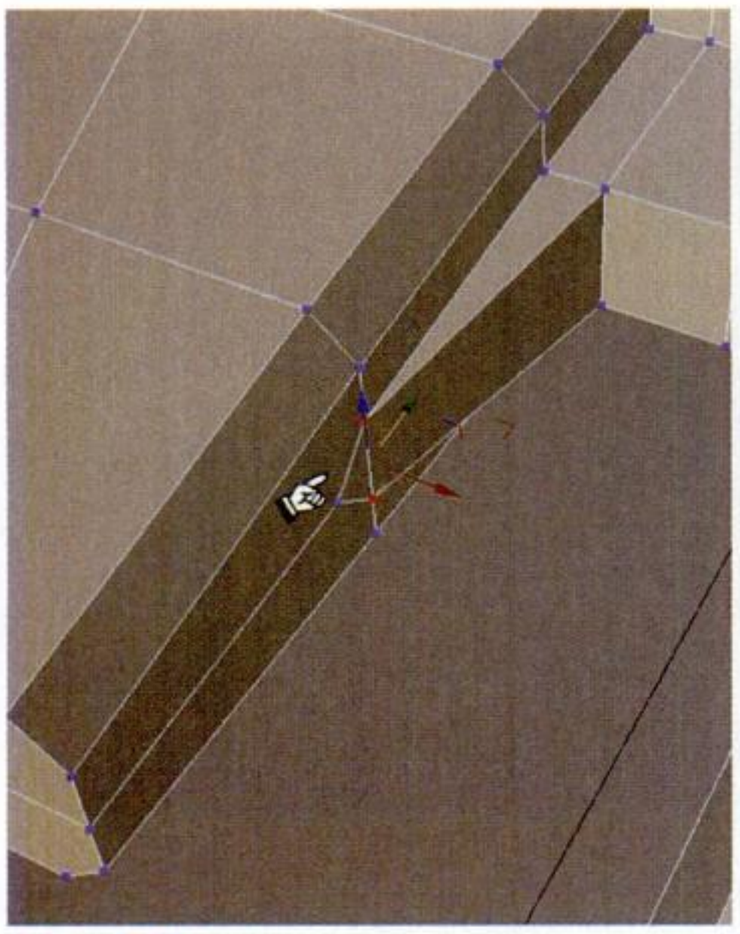
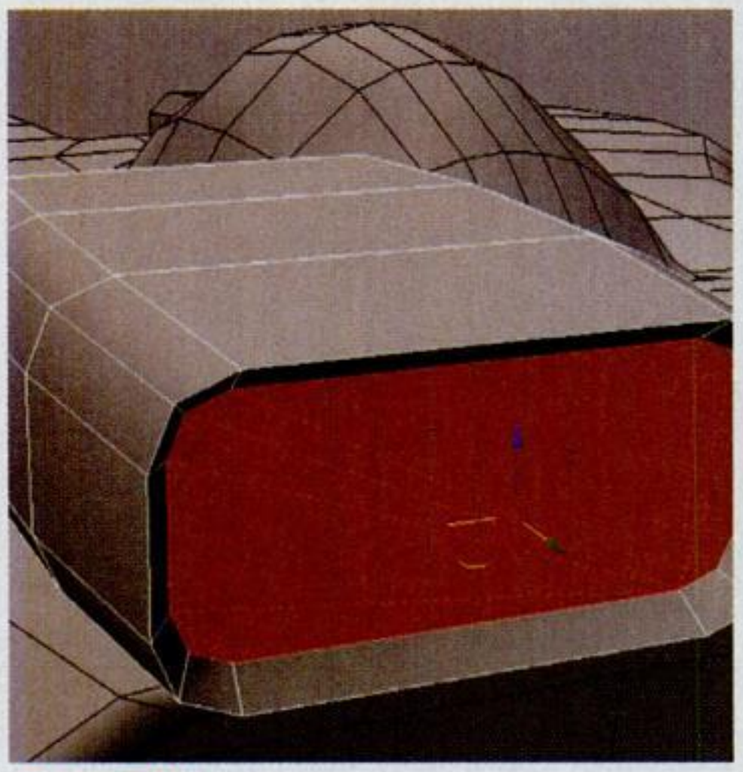


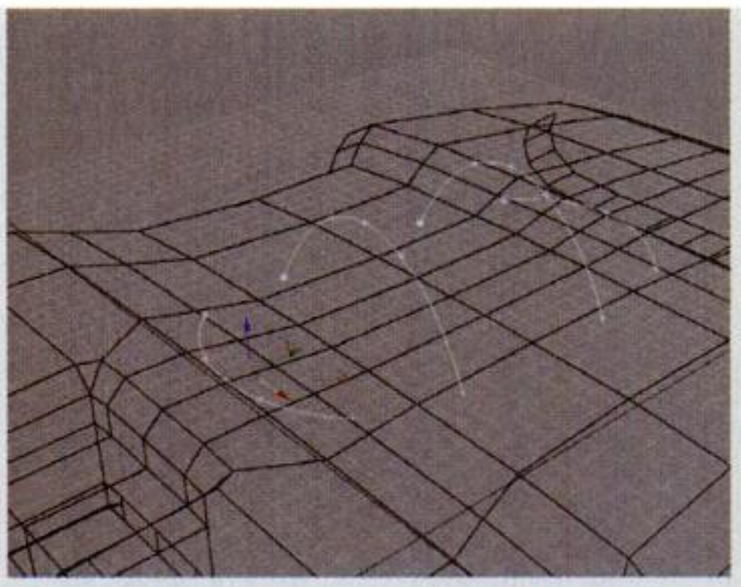
Step 12: Making the Front Interior Vents

Next we're going to extrude out the front interior vents. These will overlap the two faces on each side of the extrusion you just made, so let's delete those polygons. Now select two polygons adjacent to the deleted faces and Extrude out the two vents. Again, Extrude them out so they overlap the hole you created by previously deleting those faces. Once this is done, Weld the vertices to close the hole you made. Now, go into Vertex mode and click the Target button in the Weld group. Last, take the other end of the vent and target weld the vertices back to the original surface.



Step 15: Adding Booster Vents

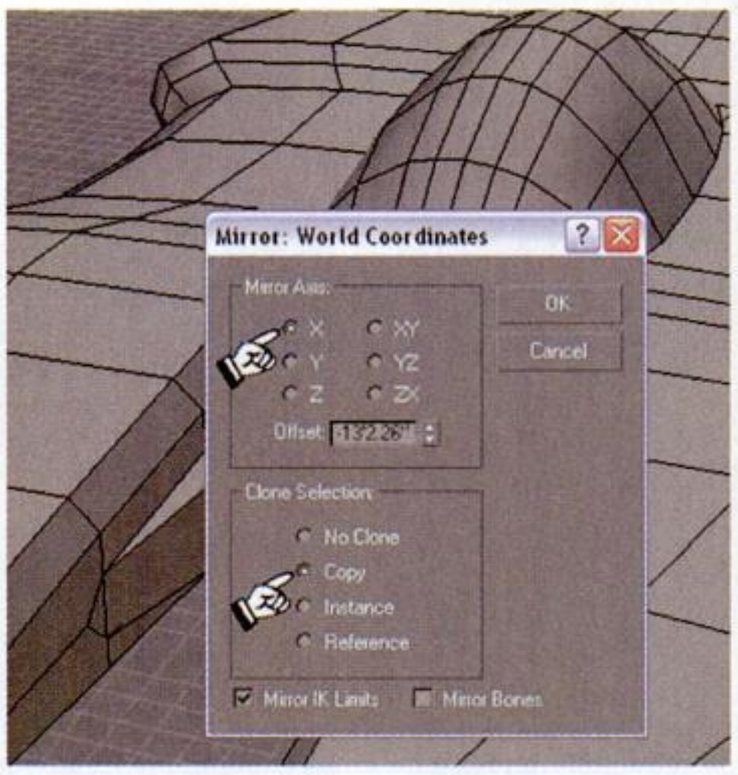
Select the booster if it's not already selected, and collapse it to an Editable Mesh. Select the two ends of the booster, and use the Bevel tool to bevel them inward. If the results aren't smooth, then use Ignore Visible Edges to select the inner ring and smooth it out.



Step 13: Creating the Canopy

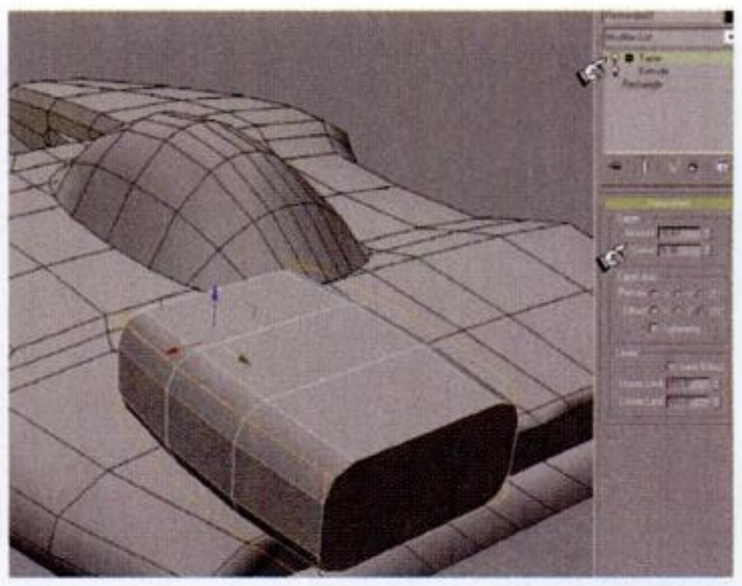
Create the canopy with patches using the same techniques we used to create the body of the cruiser. Start by using the Arc object (located in the Create>Geometry>Shapes panel) for our initial spline shape. Draw out an Arc for your canopy in the front view. Scale and rotate the objects till they look like the screen shot. After you position your shape objects, collapse them to Editable Splines. Use the Attach command to join the splines together, in order, and apply a Cross Section modifier and a Surface modifier. Set the steps to 1 this time. You may need to Flip the normals if the resulting surface appears "inside out."

Your modifier stack should look something like this: Surface, Edit Spline, Cross Section, Editable Spline.



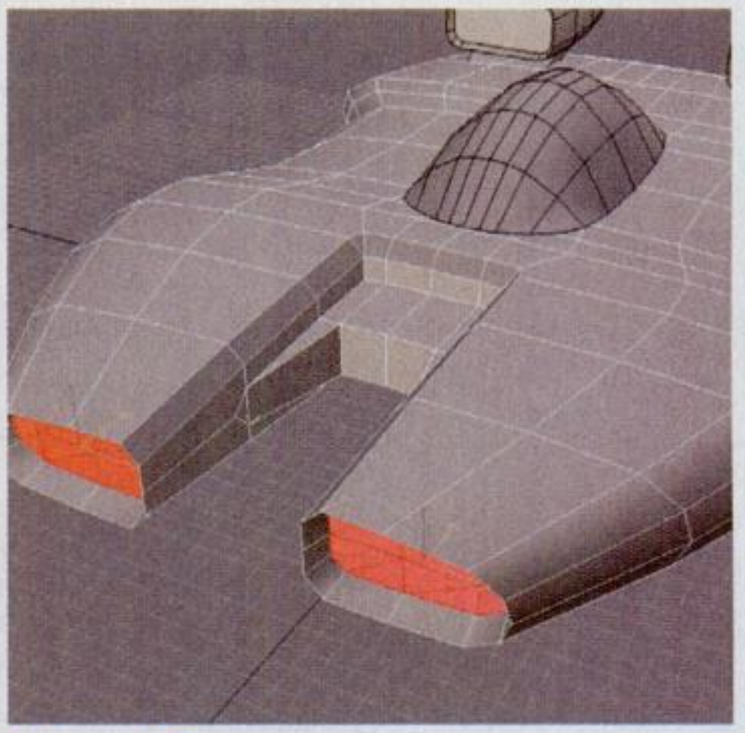
Step 16: Finishing the Boosters

To finish off the boosters, select a face on the bottom and extrude it out to attach it to the ship. We moved it forward for a more interesting sleek look. After the booster looks correct, use the Mirror tool on the main toolbar to mirror it along the X-axis. Choose the Instance option and use the spinner to offset the copy to where you want it. You might need to make adjustments with the Move tool afterwards.



Step 14: Creating the Boosters

Activate the Front view and draw out a Rectangle shape (Create>Geometry>Shapes) for the booster engines. Go to the Modify panel and turn up the Corner Radius until the shape looks the way you want it. Now change the Interpolation Steps to 1. (The default is 6 and creates more polygons than we really need). Now apply an Extrude modifier to give it some depth. Increase the segments as well (4 will do). Now apply a Taper modifier to the booster and increase the Curve Amount spinner. Take a look at the modifier stack for reference. If you are unclear about what some of the controls do, feel free to tweak them until you get the desired output.



Step 17: Making the Front Intakes

The front vents are easy to make; we will use the Bevel tool again. Enable Polygon sub-object mode. Select the polygons on each side of the front of the ship and Bevel them inward. (The Bevel tool can be found in the Quad Menu or in the Edit Geometry rollout). After beveling the faces, use the Ignore Visible Edges selection tool to select all the newly created ring faces, and make them share the same smoothing group.

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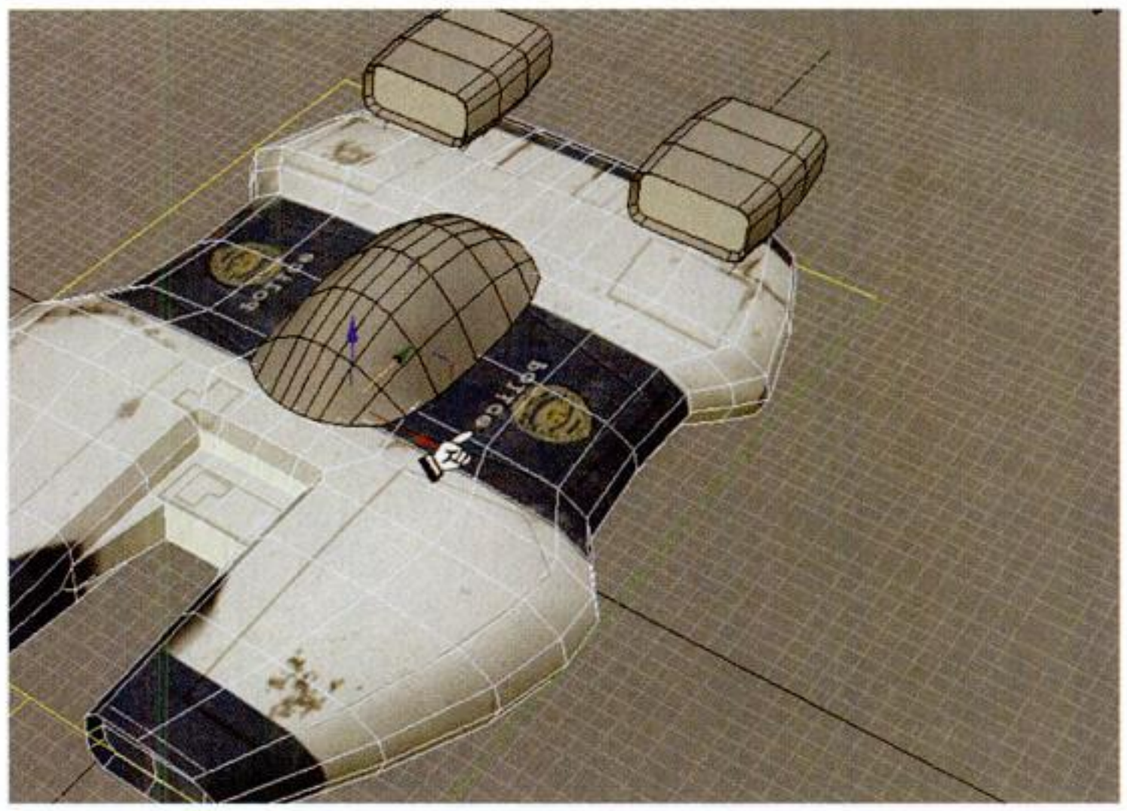
Step 18: Assigning a Material

Now that the body section is finished, let's make a new material for it so we can texture map it. We created our textures in Photoshop, but you can use any image editor. Realistic textures can make a good model look great—and low quality textures can make even the best model look bad. Once you've created your textures, save them in TGA format. Now press "m" on the keyboard. This opens the Material Editor. Click New to make a new material, and give it a name (properly naming objects and materials will save you time and grief later).

Now select the body and click Apply. This will apply your texture map to the model. In the Diffuse tab, click the Pick Map File button (look for the icon with the checkerboard in the folder). Open the *gmax* Material Navigator (the Navigator and the Material Editor work hand in hand). You can use the Navigator as your Material Library: Every texture you make will be visible in the Navigator. To edit a material double click a material in the Navigator. This will "activate" it in the *gmax* Material Editor.



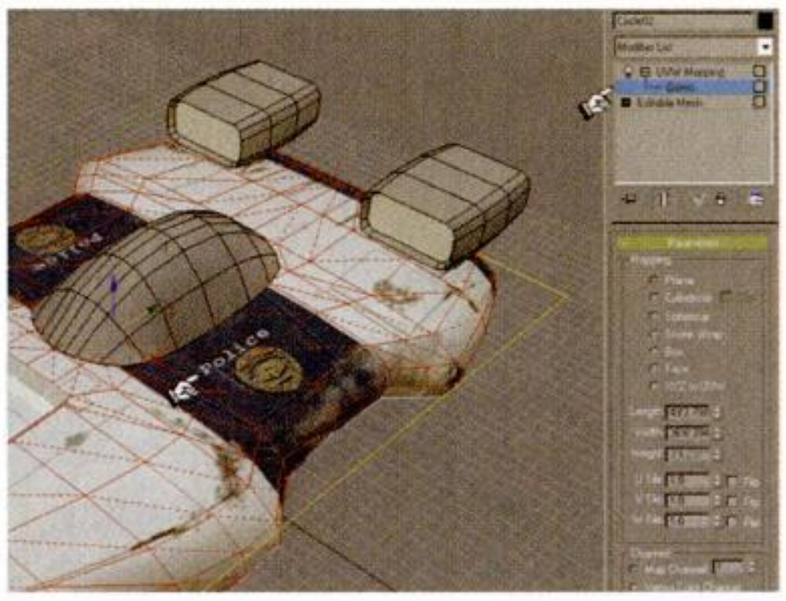
Step 19: Applying Texture Coordinates

Once you've applied a material to your ship, it might look very strange since we never applied mapping coordinates. Mapping coordinates are the instructions that position the textures on sections of geometry. Texture mapping is as much art as it is science, and only loads of practice will hone your skills.

Select the ship body and apply a UVW Map modifier from the modifier drop-down list. Once the modifier has been applied you will need to determine the best projection type. Change the Alignment radio button to Y instead of Z. Now that it's projecting in the right direction, we want to make it fit over the body. You can press the Fit button to fit it to the mesh, or use Move, Scale, and Rotation tools to position the modifier correctly.

Step 20: Mapping a Selection

As we hinted at before, texture mapping is a complex task. In the previous step we applied a texture to a whole model. In this step we will apply a texture to a selection of faces. The texture we created contains the word "Police." Now check the screen shot from step 19. If you've made that text read left to right in the last step, take a look at the other side of your model. The other side will read backwards! This problem is easy to fix. First, collapse the body to an Editable Mesh.

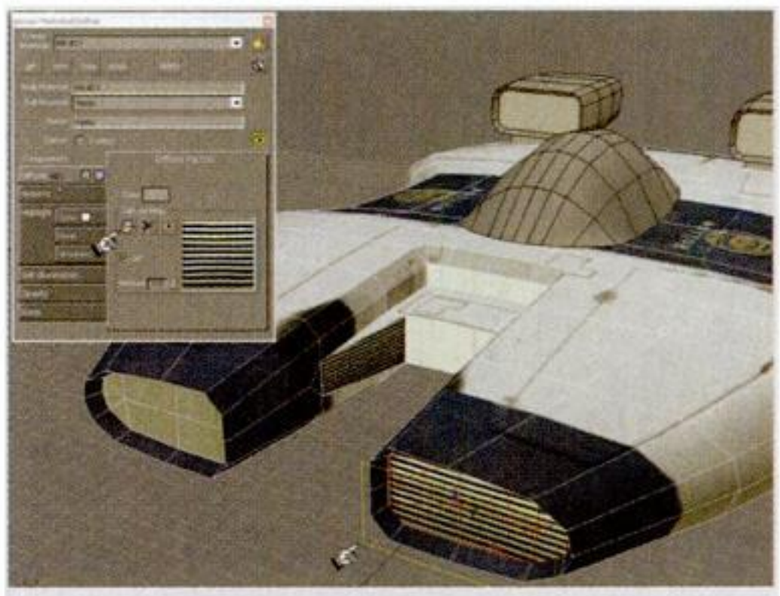


Note that the UVW Map modifier that you applied previously gets "baked into" the editable mesh when you collapse the stack. Now, select all the polygons on the side of the ship where the text reads backwards. Apply another UVW Map modifier, and this time it will map the selection rather than the whole object. Enable the Gizmo sub-object mode and rotate the UVW Map Gizmo 180 degrees in the Y-axis so that both sides have the text projecting the proper way. Repeat these steps for the bottom of the ship.

Step 21: Mapping the Front Intakes

Start again by collapsing the body to an Editable Mesh. Now, before mapping the front intakes and rear exhaust ports, let's create another new material and apply it to the faces of the intakes. Select the front intakes, and the rear exhaust port. (Use the Ignore Visible Edges tool for the flat surfaces with multiple polygons.)

Open the *gmax* Material Editor and click New. Don't forget to give it a name. Click the Pick Map File button and browse for your intake texture. Now click Apply while in Polygon sub-object mode, and the new material will be applied to the selected set of faces.



You'll need to select each group of faces and apply UVW Map modifiers to each of them at a time. Use the Alignment and Fit tools to get the UVW Map Gizmo in the right place. Try experimenting with the Normal Align tool and the Region Fit tool.

When you apply a texture to a sub-object selection, *gmax* automatically creates a "Multi/Sub-Object Material." You can read more about materials in the *gmax* User Reference.

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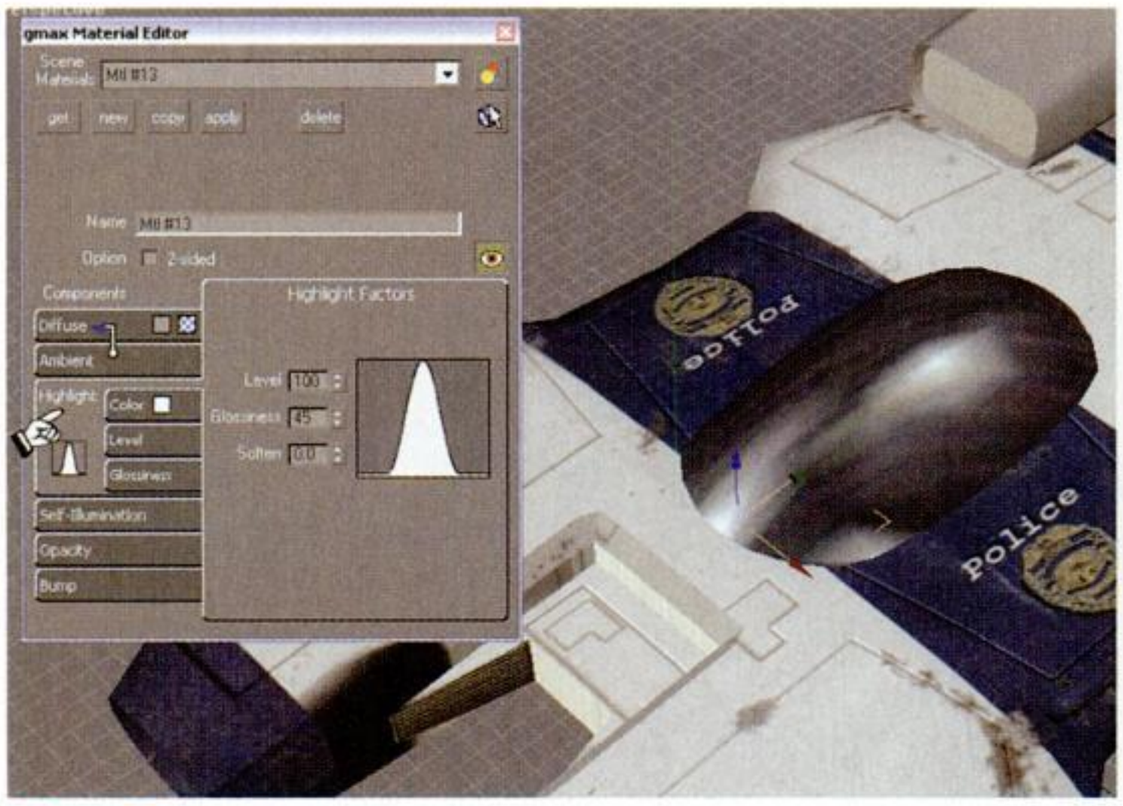


Step 22: A Shiny Canopy

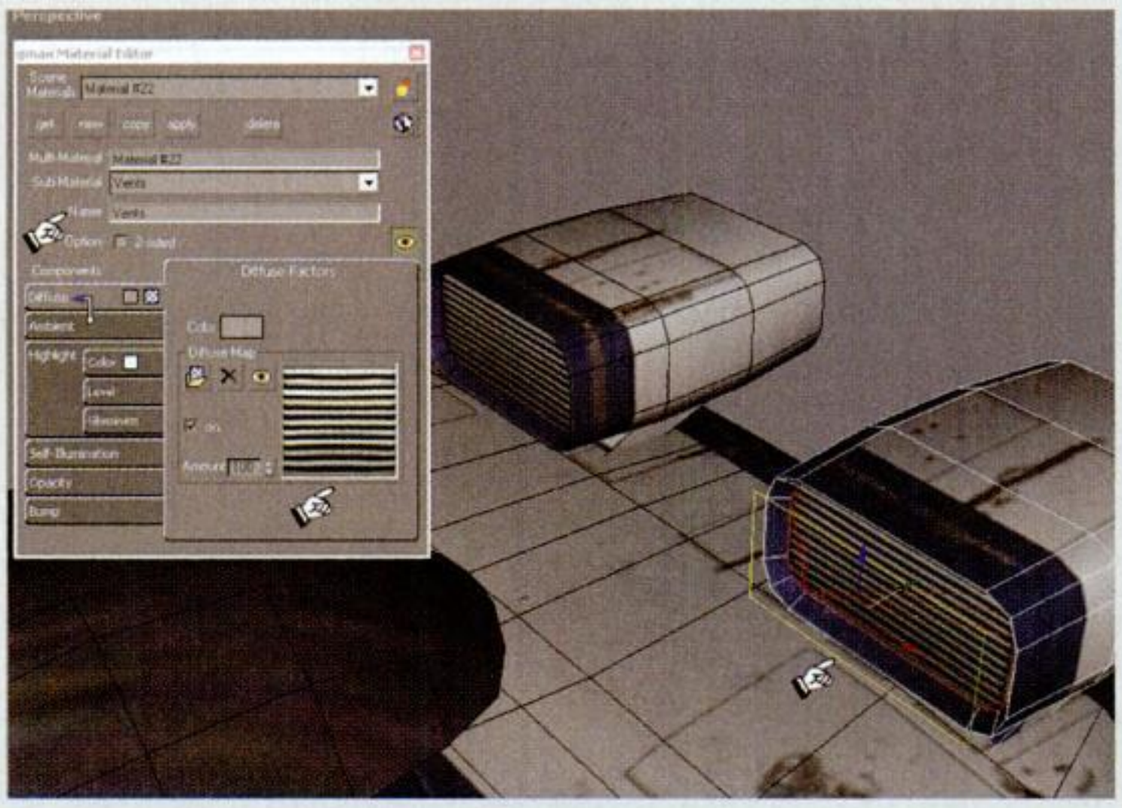
Select the canopy object. If you haven't already applied a UVW Map modifier to this object, do so now. Once again, in the *gmax* Material Editor click the New button to make a new material for the canopy. Give it a name. Choose the bitmap that you want to use for the diffuse component using the Pick Map File button. Apply the material to the canopy object.

After you apply the material to the canopy, select the Highlight component in the *gmax* Material Editor. Set the highlight Level to 100 and the Glossiness to 45. This will give the canopy a more shiny appearance. Keep in mind that this highlight effect shades the vertices of the mesh, so the more polygons, the smoother it will look. (But since this is a low-res game style model, low polys are good!)

Step 23: Mapping the Boosters

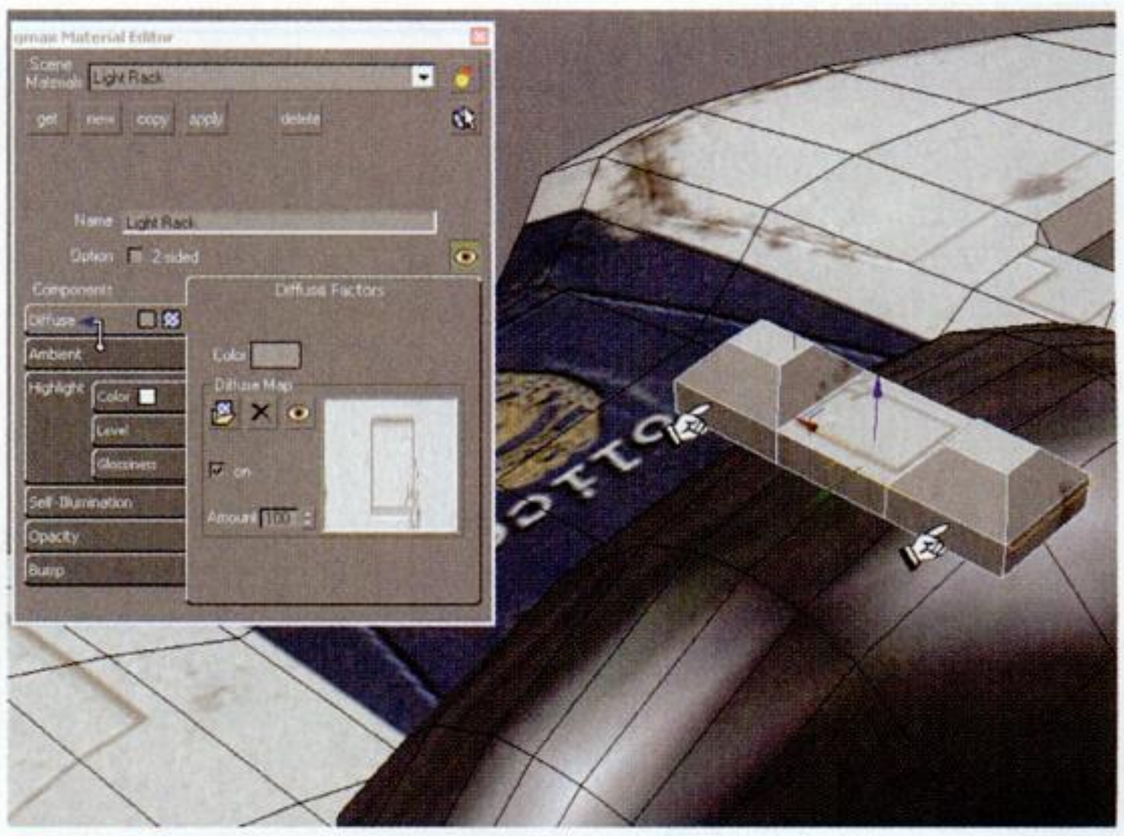
The boosters should be texture mapped using the same techniques described in the steps above: Load texture, select faces, apply UVW Map modifier. Since the second booster was created as an instance of the other, anything done to one will automatically be applied to the other. Keep in mind that collapsing the stack on either object will destroy this relationship.

Make a new material in the *gmax* Material Editor for the boosters. Pick the appropriate texture map. Select both boosters and click Apply. Since the boosters are instanced, select one of them and add a UVW Map modifier. We changed the alignment to the Y-axis, used the Fit tool, and even checked the Flip option for V Tile.



Step 24: Booster Intake Vents

We already made a vent material and applied it to the body of the ship, so let's find it and use it again here. Open up the Material Editor and select the body of the ship. Click the Get button to get the material from the ship. This is a Multi/Sub-Object Material, so pick the intake vent material from the drop-down list within the Material Editor. (This illustrates why it is important to name your materials accurately.) Select one of the boosters, collapse it to an Editable Mesh, and select the faces where the vent texture should go and click Apply in the *gmax* Material Editor. While those faces are selected, add a UVW Map modifier and repeat this for the second booster.



Step 25: Creating the Light Rack

Since the most recognizable feature of a police car is its rack of colored lights, we'll build a futuristic set for this 21st century police cruiser. Activate the Top view (press the T key in any active view port), and make a Box primitive to use as the base of the light rack. Make it rectangular and give it three Width Segments. Collapse this to an Editable Mesh and select two of the top faces on either side of the center face. You can use the Polygon sub-object mode for this operation. Use the Bevel tool to bevel out the two lights. Create a new material in the Material Editor, and choose the appropriate texture map. Exit sub-object mode and add a UVW Map modifier to the light rack.

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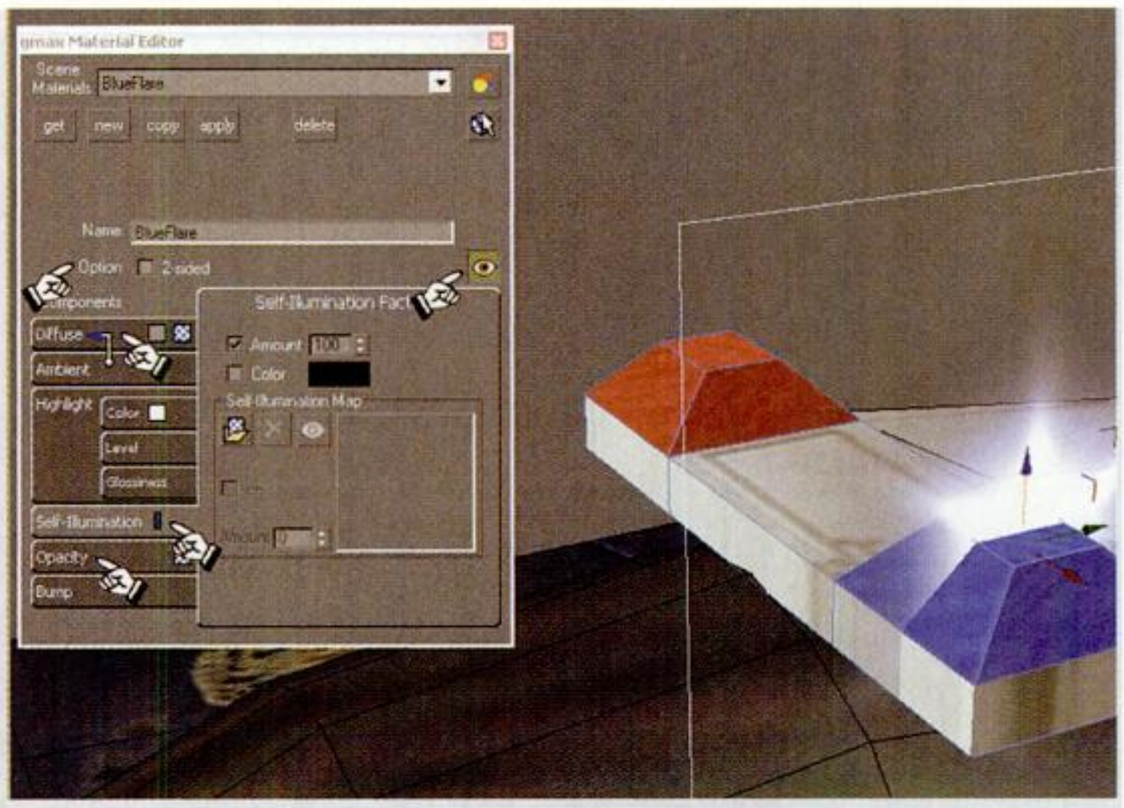
Step 26: Face Mapping the Lights

Now we'll employ another texture mapping technique: face mapping. Select the light rack and collapse it to an Editable Mesh. Select the five faces on one of the bevels that you created in the last step. Create a new material in the Material Editor and choose the red light texture for the diffuse component. Notice how the texture we created has a glass-like effect to it.

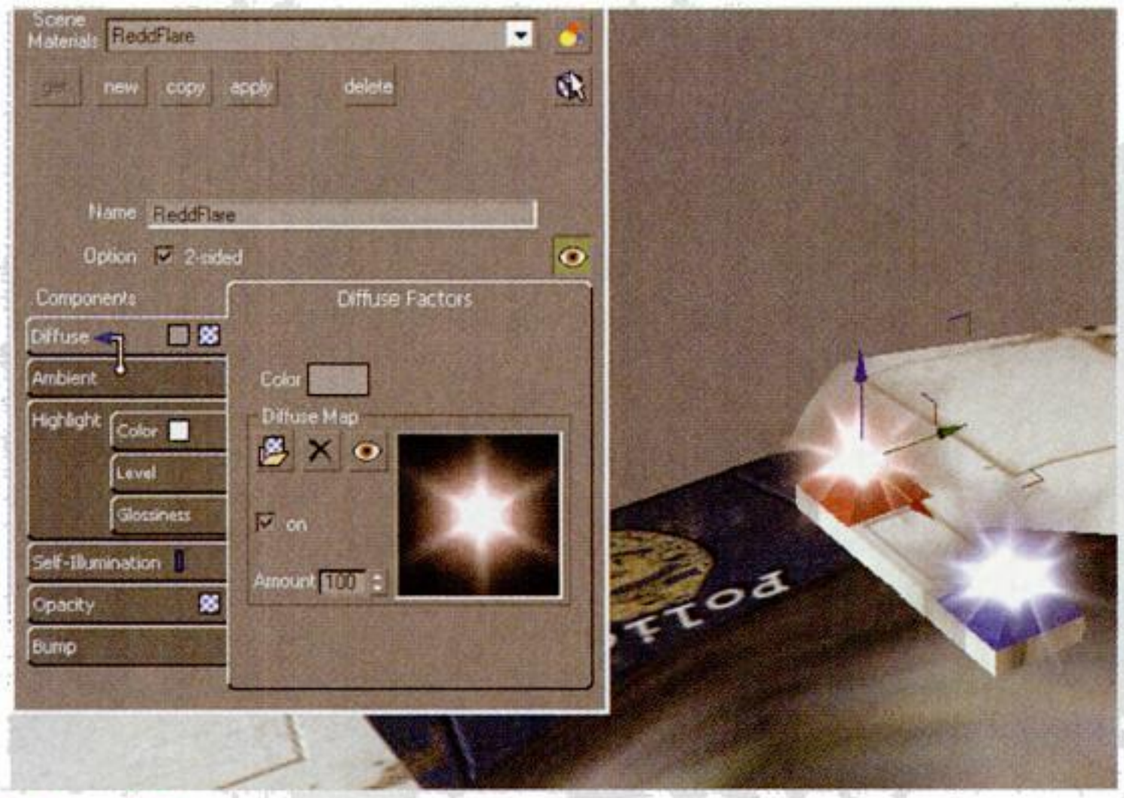
While the beveled faces are selected, click Apply. This will apply a single texture to the entire selection—which isn't the effect we want. Now apply a UVW Map modifier to this selection. The UVW Map modifier has a mapping option called Face; select this option now. This type of mapping will apply your texture to each of the selected faces and align the texture map one-for-one on each of the faces. Repeat this for the blue light as well.



Step 27: Creating the Light Flares

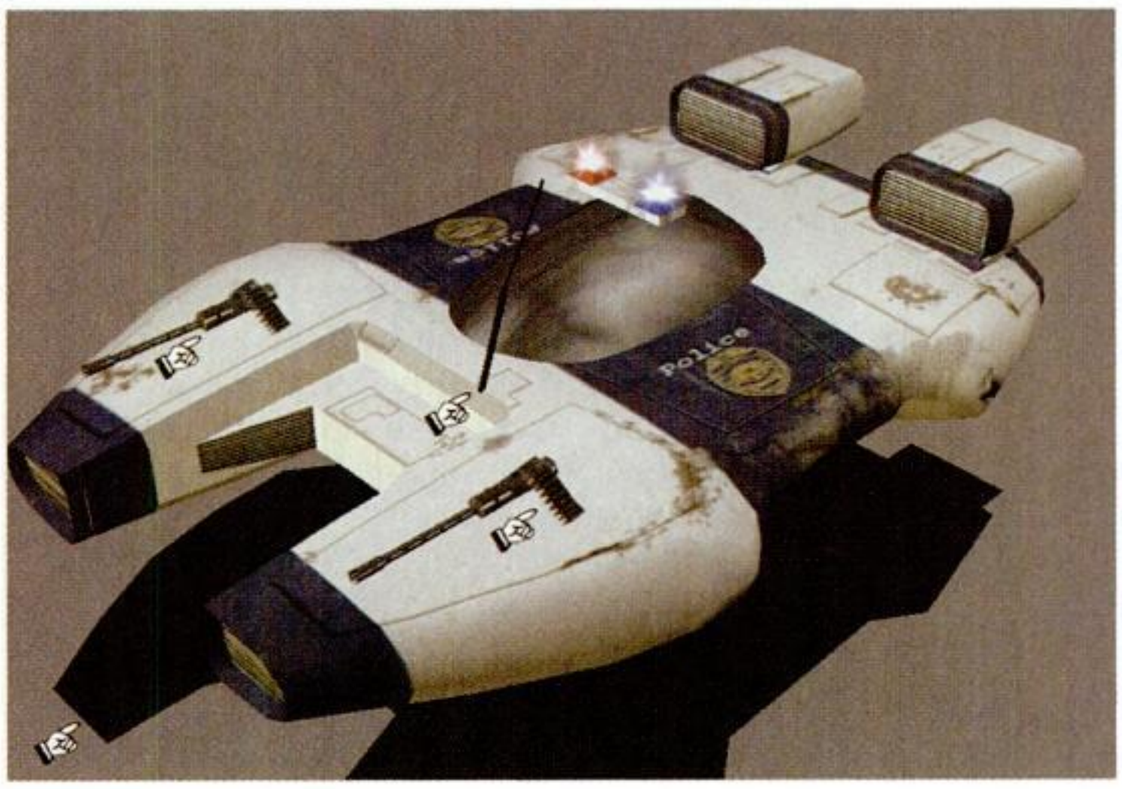
We can use transparency with textures to create interesting effects. In this step let's create light flares for the red and blue rack lights. Activate the Right view, and create a Plane object with one length segment and one width segment. To constrain the Plane object to a square while in create mode, hold down the Ctrl key as you drag out the shape.

Move the plane object to the center of one of the lights. Create a new material and pick the blue flare texture for the Diffuse component. Next, click the Opacity component. Pick the FlareOpacity.tga texture for the opacity component. This texture will act as an alpha mask for the Opacity channel. Make sure the plane object is selected and click Apply. The object should automatically become transparent. If it doesn't, click the top "eye" icon. Since this is a flare that gives off light, it should "self-illuminate." Click the Self-Illumination channel and set the Amount to 100. We also want the flare to be seen from both sides, so check the 2-Sided checkbox in the material editor.



Step 28: Finishing the Flares

Now that we have one flare all ready to go, let's copy it and rotate it so that we see a flare from all angles. Select the flare object, and while holding down the Shift key, rotate it 90 degrees on the Z-axis, so it faces the front. By holding down the Shift key, you can quickly copy, instance, or reference an object while transforming it. We used this same technique earlier—so this should be familiar territory. Do this again with the new flare, this time rotating along the X-axis. You should now have three flares that look something like the screenshot. Create another material using the red flare texture, and copy the three planes over to the other side.



Step 29: Use What You've Learned

Now that you've learned a few modeling and texture mapping techniques, add your own accessories to the model. We added machine guns, an antenna, and even a polyshape for the shadow on the ground. All of the textures required for building this model have been made available on the bundled CD for you to play with and tweak. A good beginning project would be to texture map the bottom of the model (we didn't cover this step in the tutorial). We've also included the final model for reference. A more advanced project would be to prepare this model for export for one of the *gmax* ready games. Imagine flying this cruiser around in *Command & Conquer: Renegade!* ■

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How To...

MASTER DIGITAL PHOTOGRAPHY

MAXIMUMPC
DIFFICULTY RATING
EASY

BY BRAD DOSLAND

Think you know how to take digital pics? Think again. This guide will reveal everything you don't know about picking the right camera and getting the most from your hardware, software, and digital files.

There was a time when photography was an arcane art. Just getting an image to actually appear required vast experience and dangerous chemicals. But those days are over. Today, the latest digital cameras allow anyone to capture sophisticated images with the press of a finger. Instant image preview on your camera's built-in LCD screen ensures that you never miss the moment. Special effects such as sepia toning and montaging are a click of the mouse away. Fixing classic problems—such as eliminating the red-eye effect created by on-camera flash—is equally simple; all you need is an image-editing program. This should be the golden era of photography, right?

Wrong.

Despite all the powerful tools at our disposal, digital photography is still just photography, and photography will always be a subtle art form. Anyone can take a good picture with a bit of luck, but it requires specialized knowledge to end up with a great picture. The software bundled with your new digital camera may allow you to add effects to your pics, but to realize your ultimate vision, you'll need to master the tools at your disposal. You must call the shots. And that's where we come in. On the following pages, we're going to expose you to all the information and techniques you'll need to transform your mundane snapshots into memorable images.

These two models from Olympus illustrate the trade-offs between camera body size and lens size. While the actual aperture mechanisms are roughly identical (as illustrated by the yellow circles) the C-4040 on the left has nearly double the glass of the compact D-40 on the right (as illustrated by the red circles). Unfortunately, the superior C-4040 is too big to fit in most pockets.

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Find the Right Megapixel Range

In case it ever comes up on a test: "Megapixels are to a digital camera as megahertz are to a PC." True enough, but just like the computer buyer who spends top dollar on a screaming system and then uses it just to check e-mail, digital camera shoppers often waste their money on more megapixels than they need.

In a nutshell, cameras with 1 megapixel of resolution or less (for example, webcams or the camera built into Sony's NR-70V Clie PDA) are best suited for very rudimentary shots. We're talking about reference images for insurance claims, or mug shots for a company web site. Most people will be disappointed by 1-megapixel image quality, even when compared with disposable film cameras.

Cameras rated at 2- to 3-megapixels are now affordable, with street prices starting around $200 for name-brands such as Olympus or Kodak. These cameras will more than suit the typical digital photographer, who really needs only enough resolution for onscreen viewing or to make standard-size prints. While many swear they can tell a 5x7 print made from a 2-megapixel file from one made from a 3-megapixel file, our experience is that the two prints are all but indistinguishable to anyone except a photo expert. (Of course, a good photo printer is necessary to get the most from any image's resolution.) Unless you're planning on shooting for a print publication (which requires additional resolution to reproduce the dot pattern used in the print process) or gallery-size prints, leave the latest 4- and 5-megapixel cameras (along with their inflated price tags) to the pros.

Buy the Best Lens

Since all photography is really just about capturing the light, it should come as no surprise that the lens used to focus that light is one of the most critical components of any digital camera. Sadly, many big-name companies skimp when it comes to their lenses, and image quality suffers as a result.

The first shortcut some camera makers take is to forgo a glass lens for an inferior plastic version. The imperfections inherent to plastic make it a lousy choice for a camera lens. To avoid distortion and uneven focus, stick with a glass lens. Also, when it comes to lenses, the more the merrier. While a camera can operate with a single piece of glass over the aperture—acting like a sort of contact lens—cameras with multi-element lens assemblies generally produce vastly superior images. More lenses in the assembly straighten and correct the light image before it reaches the recording surface of the camera.

Finally, size matters. Bigger glass allows more light to enter, making the camera more sensitive and better able to record images in lower light conditions, and that's a good thing. Extremely compact digital cameras typically use small lenses as a matter of necessity, so buyer beware.

	MMC	SM	MS	SD	CF
64MB	$86	$60	$60	$100	$50
128MB	n/a	$135	$100	$150	$85
256MB	n/a	n/a	n/a	$240	$160
512MB	n/a	n/a	n/a	$500	$440
1GB	n/a	n/a	n/a	n/a	$1,000

This chart illustrates the choices available in removable media, based on prices listed at LexarMedia.com as we went to press. We chose to feature Lexar for pricing comparisons, because it's one of the few vendors that sell all the different formats under its own brand. Notice the size and cost benefits of the CompactFlash format.

Pick the Right Removable Media

Size also matters when it comes to removable media. Currently the shelves are glutted with an unnecessary variety of removable memory formats, from CompactFlash to the thinner Memory Stick to the even slimmer SmartMedia to the even smaller MMC and SD cards. Which format your camera uses makes a huge difference.

Recently, Olympus and FujiFilm announced yet another media format: the tiny xD-Picture Card. But the physical size of the memory card isn't the most important factor when selecting a digital camera. It's all about the capacity of the card. At press time, only two formats—CompactFlash and SD—boast capacities larger than 128MB. SD tops out at 512MB, while CompactFlash is currently available in 1GB cards. To put this all in perspective, understand that a 3-megapixel camera can store nearly 1,000 images on a single 1GB card, while only about 100 images would fit on a 128MB piece of media. Large capacity is especially important when you're on the road and don't have an opportunity to frequently offload images. Sure, you could carry multiple 128MB cards, but these precious slivers are easily lost in a backpack or suitcase.

Finally, the companies that make removable media will tell you that the speed of the media makes a big difference. True and false. On a high-end camera, you can tell the difference

These pictures illustrate the difference in resolution between a sub-megapixel image and a 4-megapixel image. Details are completely lost in the sub-megapixel photo (bottom), while details in the 4-megapixel photo (top) stand up to magnification many times over.

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between 1x and 24x CompactFlash. But that margin is negligible on most consumer cameras, which suffer bottlenecks in the actual record mechanism.

Pick the Right Battery

Batteries may seem like a low-tech consideration, but no other component will have a bigger impact on your shooting. Unfortunately, no other choice you make when buying a camera will be less clear-cut.

Digital cameras are notorious juice hogs. It's not uncommon for a camera to drain a brand-new set of standard batteries in less than 20 shots. Ouch. The problem is that digital cameras need batteries to be "topped off." When the current falls below a certain threshold, the camera thinks its batteries are dead, though they may still be able to provide hours of life in a less demanding device, like a portable MP3 player. For this reason, standard batteries aren't the best possible choices for digi-cams. They really have only one saving grace: They're available for purchase almost everywhere you go.

Deciding between the convenience of rechargeable Nickel-Metal Hydrides (left), the efficiency of proprietary Lithium-Ion cells (center), and the mixed-skills of specialized Lithium-Ion batteries (right) is a difficult call. But most casual enthusiasts go for off-the-shelf batteries in a pinch.

On the flipside, proprietary Lithium-Ion batteries last longer than standards and can be quickly recharged, saving massive money compared to disposables. But if you're shooting on the road and you run out of juice without an outlet or your proprietary charger around, you're screwed. One option is to buy and charge a backup battery, but backups can be very expensive ($50 to $100) and can drain as well.

The best compromise for some people might be a camera that uses rechargeable Nickel-Metal Hydride batteries. These cells sport a relatively long life (typically a charge is good for hundreds of shots) and are economical. Only you can make the call.

Choose Bells and Whistles Wisely

The ads for digital cameras are littered with esoteric specs. Some of them are important, some aren't. Here's a quick overview of what to look for and what to ignore.

Serial connection? USB? FireWire? Who cares? Get with the program and invest in an inexpensive external media reader. Some are available to read all media formats.

■ Zoom lenses will allow you to get closer to the action, and most good cameras include at least a 2x or 3x optical zoom. But beware of the digital zoom; it only degrades picture quality and should be shunned.

■ The ability to record short video clips is becoming more and more common, but don't be misled. Digital cameras are not yet a substitute for an actual camcorder. Your video clips will be short and chew up vast real estate on your removable media, and the quality tends to be dismal. Many cameras don't even capture audio with the clip.

■ Direct-print features that allow you to make prints directly from the camera can be handy, but only if you invest in a special DP-capable printer.

■ When it comes time to download images from your camera to your computer, make sure you have at least a USB option. Serial connections are just too slow and buggy. If a FireWire or USB 2:0 connection is available, go for it.

■ Many cameras come with a bevy of auto-exposure modes and/or exposure bracketing. Most of these are useless, so you'll want to make sure your camera has the ability to manually override the exposure to compensate for backlighting.

■ The last thing to consider is the camera size itself. Small cameras make certain sacrifices (smaller lenses, small LCD preview screens, awkward grip), but compensate by being easier to pocket. An old photo truism says it all: "The best camera is the one you have with you."

Find the Right Image Editor

You can't beat the price of bundled editing software, but you may not want to suffer through the buggy, underpowered crap that ships with some cameras. While many cameras include excellent name-brand software from companies such as Adobe, others toss in low-rent programs that can actually damage your precious images. Don't be afraid to bail on the bundled shovelware for one of these alternatives.

■ Version 7.0 of Adobe's venerable *Photoshop* does everything you can imagine, and better than any other contender. Many people swear that *Photoshop* is the most perfect piece of software ever, in terms of power and grace. But that perfection comes at a steep price. Tipping the scales at more than $600, *Photoshop* is not for everyone.

■ With a price tag of less than $100, *Photoshop's* little brother—Adobe *Elements 2.0*—is for everyone. We reviewed this app in the October issue of *Maximum PC*, and found that it sacrificed just a few high-end pro features of its big brother, but for a $500 savings. *Elements* will help you crop, color-correct, stylize, cat-

There are many choices when it comes to image-editing software, but dollar for dollar, it's hard to beat Adobe *Elements 2.0*. Calling it "Photoshop Junior" does this robust app a great disservice.

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alog, and infinitely tweak your digital pics ad nauseam. It rocks, which is why we gave it a Perfect 10 verdict.

■ Another viable sub-$100 alternative is JASC's *Paint Shop Pro*, also in its seventh iteration. This program spares no power when it comes to image editing, but comes up a tad short when compared with the more intuitive interface of Adobe's offerings.

■ Ulead's *PhotoImpact 7.0* costs less than $100 and is another excellent alternative, but the company's *Photo Express* software is woefully underpowered for all but the most rudimentary fixes. This is also true of other bargain-bin software, such as Micrografx (ne Corel) *Picture Publisher*, ArcSoft *PhotoImpression*, MGI *PhotoSuite*, and Microsoft *Picture It*.

Finally, If you post your pictures online, you may want to consider Macromedia's *Fireworks MX*. While the $300 price tag is intimidating, webmasters swear by this indispensable tool.

To Print or Not to Print, What Are Your Image-Sharing Options?

Many digital photographers have a hard time breaking out of the "FotoMat Paradigm," the inclination to make 3x5-inch prints of every picture snapped. It doesn't have to be this way, folks. You have a PC—so use it!

If you want to avoid dusty shoeboxes and faded prints, but still want to share your images with friends and family, fire up a free online account such as the one provided by Yahoo! These services allow your peeps to see your pix from anywhere in the world, and they can even order prints.

For starters, viewing images on a big PC screen is a much better choice than squinting at small prints. The color onscreen is brighter, the detail is richer, and the image is bigger. And if you're not content with seeing your images on a computer monitor, most modern digital cameras include a cable to toss pictures on a big-screen TV, which is perfect for sharing vacation slide shows with unwitting visitors.

Another great option is using online photo-sharing web sites, such as Kodak's Ofoto.com. These free services allow you to upload your images to a web page, where they can be viewed by anyone with net access. They also offer additional services (usually for a fee), such as to print orders by mail. (This puts the ball back in the court of relatives who are always pestering you for reprints of the baby.) Yahoo! offers an excellent version of this service at Photos.yahoo.com. Shutterfly.com is another veteran service with a good reputation. There are many other photo-sharing options, but going with one of the reputable names helps ensure that the time you invest uploading images won't be wasted when the site goes under in a month or two. Also, always remember to keep backup copies of all your images. Even the established sites could go out of business, and you don't want to lose your images if that should happen. Finally, shop around. These sites frequently offer free prints and other perks for new sign-ups.

If you do decide to print your pictures from your desktop, test the printer before you buy if possible. Specs alone do not tell the whole story. Some printers are simply better for photos. Many modern inkjet printers make excellent photos, especially when used with dedicated photo paper. Splurge for the good paper and your prints will also last longer, and not fade away. In a May 2002 review roundup, *Maximum PC* found the Epson Stylus Photo 1280 to be the best photo printer available, and awarded it a 9 verdict.

Indispensable Utilities

It doesn't take long to begin filling a folder on your hard drive with digital images, but without the right tools, you might as well be stuffing them into a dusty shoebox. A cataloguing utility will help you find just the pictures from that trip to Vegas, or only the images of college friends, or any particular images you're looking for. And when you've found what you're looking for, many of these utilities will compile the images

Man does not live by image editing software alone, so be sure to check out utilities such as Xecute Software's *Smart Pix Manager*. This awesome tool allows you to catalogue your images in a robust database that makes it easy to find just what you're looking for.

into a custom web page or screensaver, or burn them to a CD. There are tons to choose from, and you may want to try a few to see what fits your taste, but start with database-driven choices such as Fookes Software's *Album Express*, Xecute's *Smart Pix Manager v5.52*, or Harry Doldersum's *PictureBook v1.4*.

While the new *Photoshop 7* and *Elements 2.0* do include a long-overdue thumbnail browser, a dedicated image browser is a must for any digital photographer. ACD Systems' *ACDSee* is the best. Among the staggering amount of features in the latest 4.0 version are: the ability to create ZIP archives within the program; support for video files and video frame capture; and slideshows with text, sound, and transitions. Plus, there's even a mobile version of the program for the Palm platform. *ACDSee* is the complete package, and it's amazingly fast. When you want to see a JPEG, don't wait for *Photoshop* to crawl to a start. PhotoDex's *CompuPic* is similar to *ACDSee* and is $10 cheaper, but lacks some of *ACDSee's* grace.

Lastly, you may want to buy an expensive piece of software you hope you'll never use. German developer Convar makes *PC Inspector Smart Recovery*, which recovers files that have been accidentally deleted from a camera's removable media (assuming you haven't already overwritten the media with new pictures). It's pricey at $140, but if it helps you save that picture of the Loch Ness monster...

Getting the Shot

You've got the gear and you've got the software, now the hardest part: Getting the shot. Now, we can't teach you in a

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scant few paragraphs all the mojo that artists spend years developing, but we can turn you on to a few simple techniques guaranteed to make your pictures better.

Photography is all about filling the frame with good stuff, then putting it together in an interesting way. What makes something interesting enough to take its picture? Ultimately this is a matter of taste, but there are some easy guidelines. First, is it unusual? People are more interested in seeing the rare than the common. And if you're shooting the commonplace, shoot from an uncommon angle: eye-level with a dog or looking down on a street scene.

Next, there's contrast. This means putting the very big next to the very small, the very strong next to the very fragile, the dark next to the light, and so on. A prime example of this principle is pattern-breaking. Imagine a photo where everyone in the stands of a tennis match is looking to the left—except one person who is looking to the right. That's contrast. Same thing works for color. Imagine a bright red flower in a field of green.

But where to put your subject? There are endless options, but a great rule is to avoid the middle. Too often people use the target in the center of the viewfinder as a bullseye when it should be just the opposite. Follow the "Rule of Thirds" and place the horizon, the person, or whatever your subject happens to be about one-third of the way in from the top, bottom, left, or right of the frame. When taking a close-up portrait of a face, place the eyes at the top third.

Shedding Light on the Subject

Learning photographic lighting techniques could easily demand a lifetime of practice, but here are a few simple tips that will dramatically improve your pictures.

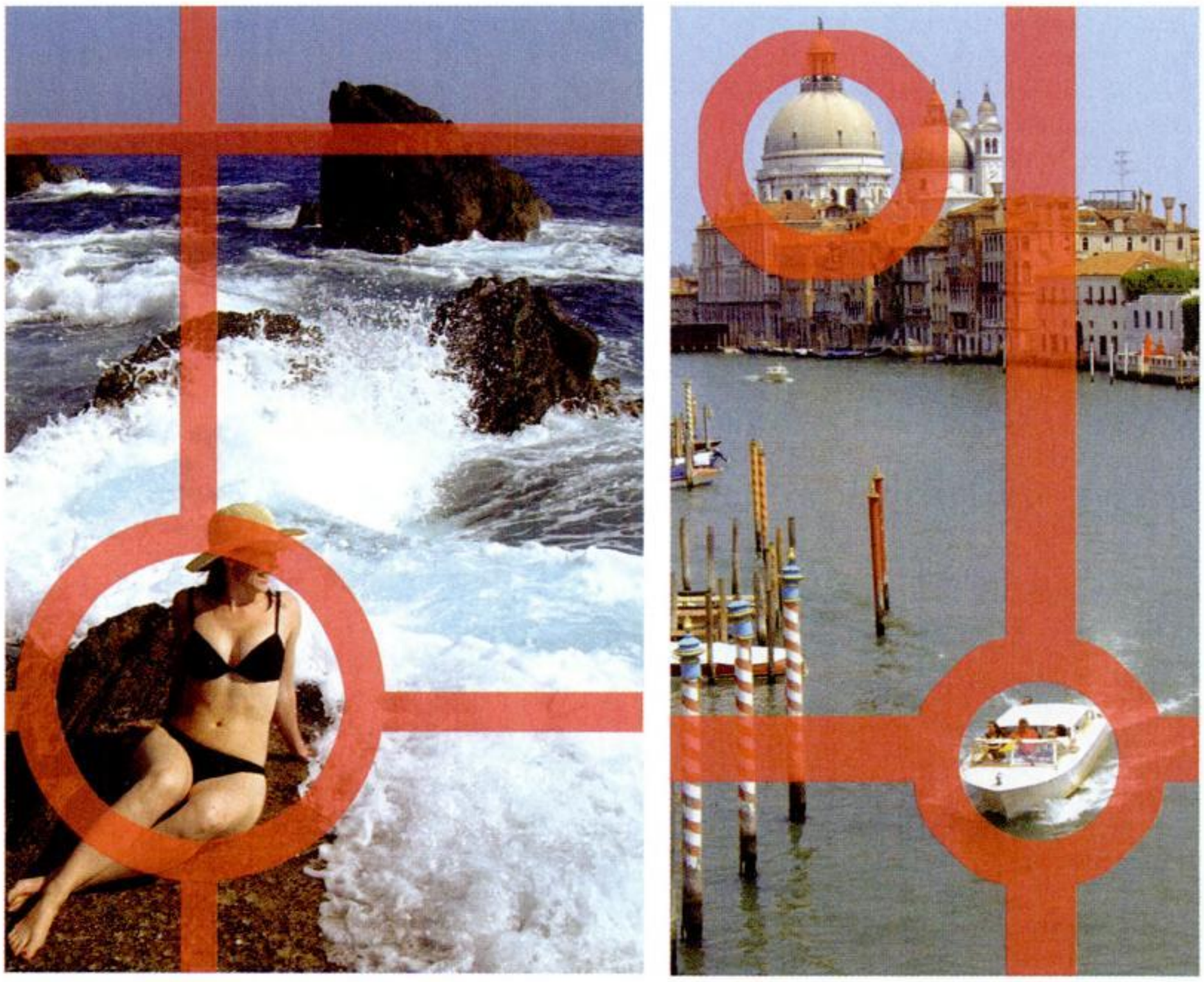
First and foremost: Don't flash. The tiny built-in flash on your camera is the worst enemy of good photography. Because it's mounted so close to the lens, you get the red-eye effect that makes people look like they're possessed. Sure, you can use the special no-red-eye mode that sends out a disco strobe of flashes before the picture is actually taken, but this results in your subject looking stunned. A classic no-win situation.

Then there's the flash light itself: cold, shallow, and flat. Most on-camera flashes are limited to a range of 10 feet or so. This means you either put your subject against a wall and get an obnoxious halo shadow, or you stand them away from any walls and your subject appears to be floating in a black void. Again, no win.

By positioning this troupe of Tunisian dancers in the open shade, with indirect light reflecting on them from the white building and steps, you can create very flattering light that typically requires a studio setup to achieve. Depending on your camera's white balancing, you may need to correct the color slightly for the blue tones of the shadows.

Shooting in low light is a problem, but shooting in direct sunlight is too. Direct mid-day sun creates harsh shadow lines on your subject, which can be effective with dramatic architectural studies but not very flattering on people. And the old trick of putting the sun behind your shoulder usually just results in pictures of people squinting. Ironically, if you absolutely have to take a picture in direct sunlight, be sure to use the flash (in fill-flash mode, if your camera supports it) to fill in the harsh shadows.

Oftentimes, the best place to shoot outdoors is known as "open shade." This is an unobstructed area in the shade where sunlight can reflect off surrounding buildings, walls, sidewalks, etc. This creates even, pleasing light. The best light, however, can always be found at dawn and dusk. This perfect light is what the professionals use, and the only thing that can get a supermodel out of bed before noon. But the peak moments are brief, so be prepared.



These images illustrate the advantages of placing your subject (and horizon line/background object) away from the center of the frame. Using the "Rule of Thirds" results in much more visually engaging photographs.

Tricking the Camera into Taking the Shot You Want

With today's automated cameras, many of the trickier aspects of photography have been taken out of your hands. While this does make getting a shot easier, it

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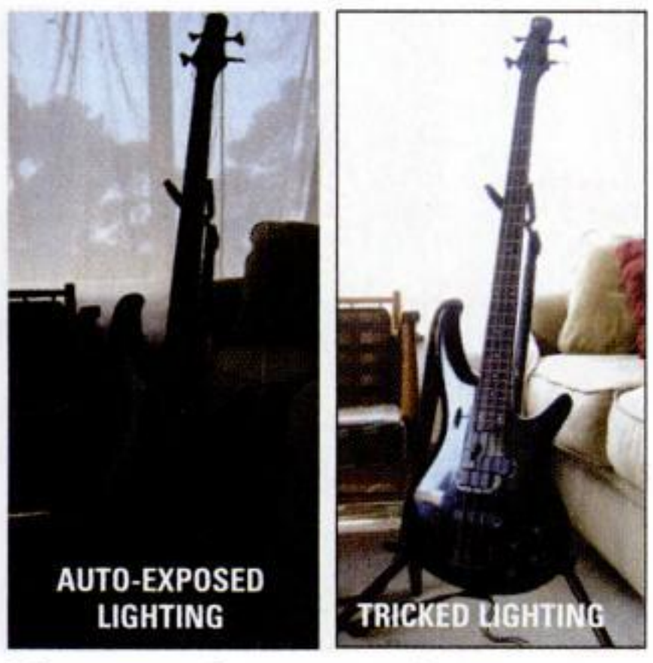
can make getting the shot you want much harder.

A great example is a room with daylight flooding in from the windows. If you let the camera's auto-exposure handle matters, you'll end up with a dark room with glowing windows. Some higher-end digital cameras have manual override features that allow you to compensate for hot spots, but here's a simple technique that's faster and works on nearly all cameras: Before you take the picture, point the camera at a part of the room where there are no windows in the frame. Press the shutter halfway to get an exposure lock and hold it there, then pan back to the shot you want to take, and press the shutter completely.



The camera's automated exposure is great for most situations, unless you have backlighting. In the first pic, the camera's light meter read the bright light of the window and exposed for the window, not the subject. A quick solution is to tilt the camera down, so the window's not in the frame, then get an exposure lock by pressing the shutter halfway. Now tilt back up to your original frame and take the shot.

Simple but effective. Just make sure the object you use for exposure-locking is roughly the same distance from the lens to avoid any focus issues.

Another common conundrum is the "person in front of the landmark." Here's the deal. For smaller objects, such as animals in a zoo, have the person get as close as possible to the background, then use the telephoto feature to zoom in as tight as possible. Back up to get everything in the frame. The telephoto effect will compress the person in the foreground with the background object. The opposite applies to larger background objects, such as Mount Rushmore. In these cases, you want to zoom the lens to the widest setting and have the person come close to the camera so they fill up either the right or left-hand third of the frame. Trust us, this works.

Beyond the "Auto" Settings

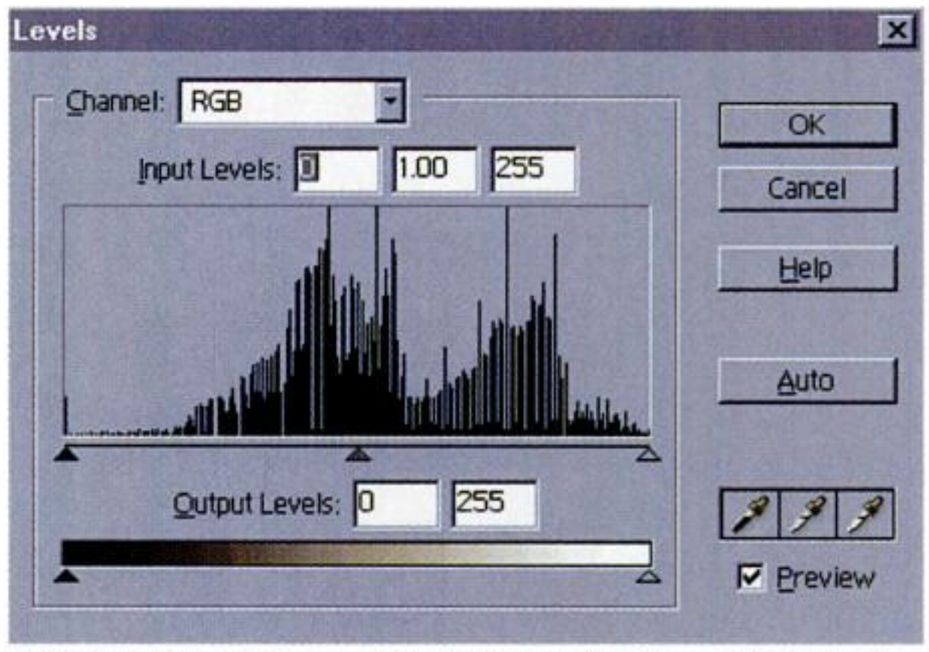
The great thing about the state of digital photography is that the editing programs themselves have evolved. The tedious tasks you most often need to perform have been automated, often to a single click of the mouse. And believe it or not, these Auto settings can be remarkably effective in a majority of cases—so if you're a digital photographer, don't reflexively snub your software's "Auto" options.

That said, when you do need to get "hands on" with your pictures, consider the following.

Many burgeoning photographers like the Variations tool in *Photoshop* and *Elements* (other programs have similar tools, but we'll limit ourselves to Adobe terminology for this section). This tool allows you to actually preview a bunch of editing options, such as color shifts, and allows you to set the intensity for these changes. This helps you learn how to visualize the possibilities for image correction, but it can also be tricky picking the right direction when all the choices appear side by side. One technique is to decide which correction you think you want, then look away at a normal photo (such as a poster or one in a magazine), then look directly back at your selection. This helps clear your eye—just like a sorbet might clear a gourmet's palate.

Once you're beyond the Variations tool, consider going straight to the Levels tool. At first, this interface may appear very foreign, but it's really just a linear, visual display of all the data intrinsic to an image. The data is graphed on an X-Y axis, and by adjusting different appropriate levels, you can manipulate color shifts, brightness, and contrast. It will take a bit of time to become familiar with the white-point, black-point, and mid-point sliders underneath the graph, but once you get the hang of it, control becomes intuitive. *Photoshop* also has a Curves tool, which is handy for quick contrast and brightness adjustments, but this amenity is sacrificed in *Elements*.

In terms of actually applying manual image adjustments, two pointers are in order. First, always work on a copy. Sometimes genius work just looks hokey the next day. Second, when applying an effect, use our "too-far-and-back" technique: Crank the settings until the image preview definitely looks wrong, then go back to the midpoint between "all wrong" and where you started. This is an easy way to teach yourself the moderation that's required to become a great image editor.



After you become comfortable with the automated tools provided by your image editing software, you'll want to try your hand at more ambitious manual corrections, such as Adobe's Levels tool. With a slide of the arrows below the image graph, you can control brightness, contrast, and color corrections with amazing accuracy.

Tools You Should Never Use

Not every tool available in the basic image editing interface serves a useful purpose, so let's just leave you with this: Stay away from gimmicky filters! You know the ones we're talking about: brush filters, distortion filters, stained glass filters, solarize filters, and (god forbid) lens flare filters. The list goes on and on. We know some of them can look kind of cool, and there's bound to be some instances where they're actually applicable. But in an effort to beat down visual clichés, you should make a promise to yourself to use each special effect filter just once in your lifetime. In magazine publishing the filters are used every now and then, but rarely for actual photography. Instead, you're more likely to see the filters applied to logo treatments or background texture—visual devices that are often supposed to look surreal. ■

If you want to completely disfigure *Maximum PC* contributing editor T. Liam McDonald, apply some wacky *Photoshop* filters to his photo. Just don't call it art.

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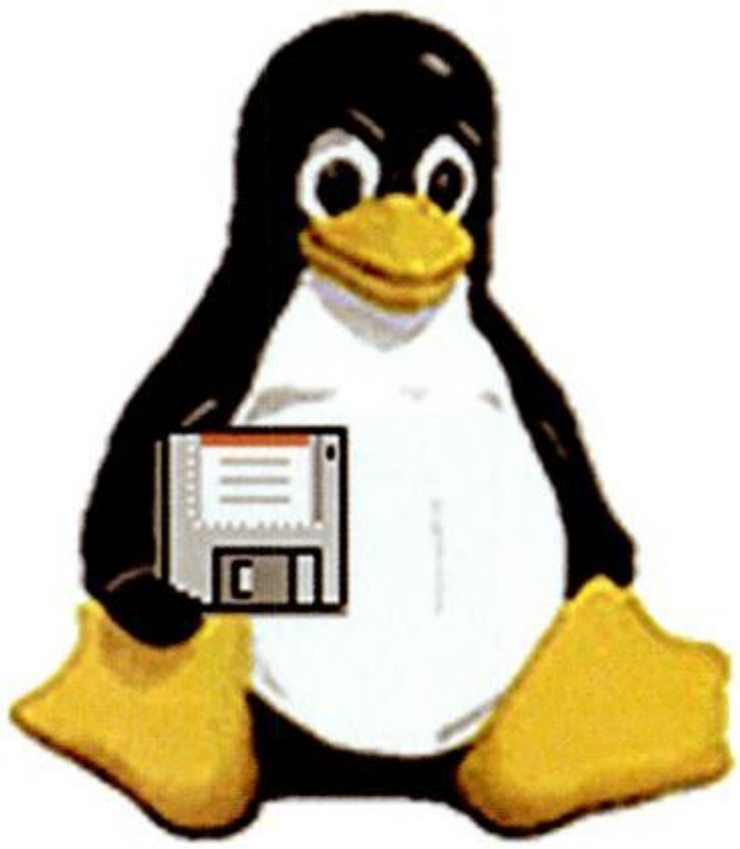
How To...

MAKE A LINUX ROUTER

Why throw away that old PC, when you could turn it into a high-speed Internet router?

MAXIMUMPC
DIFFICULTY RATING
HARD



Shopping List:

- Internet connection (dial-up, DSL, or cable)
- BBI Agent Router: free at www.bbiagent.com
- 386 or newer PC with 8MB or more of RAM: less than $50 if you don't already have a junker
- 1.44MB floppy drive and diskette
- Two supported Ethernet or NE2000 compatible network cards: $10 to $50 each (see www.BBIagent.Net/en/hardware.htm for a list of compatible adapters)
- Network hub or switch with enough ports to connect all your PCs to your router: $50
- Assorted Ethernet cables

BY CHRISTIAN "WOLFMANN" LESEMANN

Do you want to put more than one PC on your high-speed Internet connection? It's easy to do if you have a router. Sure, you could just use the Internet connection software that's built into Windows, but then you'd have to leave your main PC running all the time. You could also go to CompUSA and plunk down $150 for a stand-alone boxed router, but that would mean buying new, expensive equipment. And this would be a crying shame, considering that most PC geeks already have most of the hardware they need sitting in a closet, just collecting dust. In the following nine steps, we show you how to turn your ancient, long-forgotten PC into a state-of-the-art Linux-based router.

As with any how-to, make sure you read and understand all the instructions before you begin. You don't want to get halfway through the project, then realize you're in over your head. This advice is even more relevant when you're dealing with a powerful but finicky operating system such as Linux.

For this how-to, we'll use a floppy-size distro of Linux known as *BBI Agent*. It doesn't require any major computer hardware, just a 386-class machine with 8MB of memory. We selected *BBI Agent* because it supports everything you'll need to get your network running, it also includes a *Netfilter* (**www.netfilter.org**) firewall, and is stupidly-simple to set up. And unlike most of the router/gateways sold on the open market, the router we're configuring will even work with external dial-up connections.

Now, we know what you're thinking: "Sounds too good to be true—there must be a downside." Fear not, skeptics. *BBI Agent* has all the features of a residential gateway/router yet is highly configurable and extremely stable. It even has advanced features that consumer-based gateways/routers don't have and can support up to 60,000 clients

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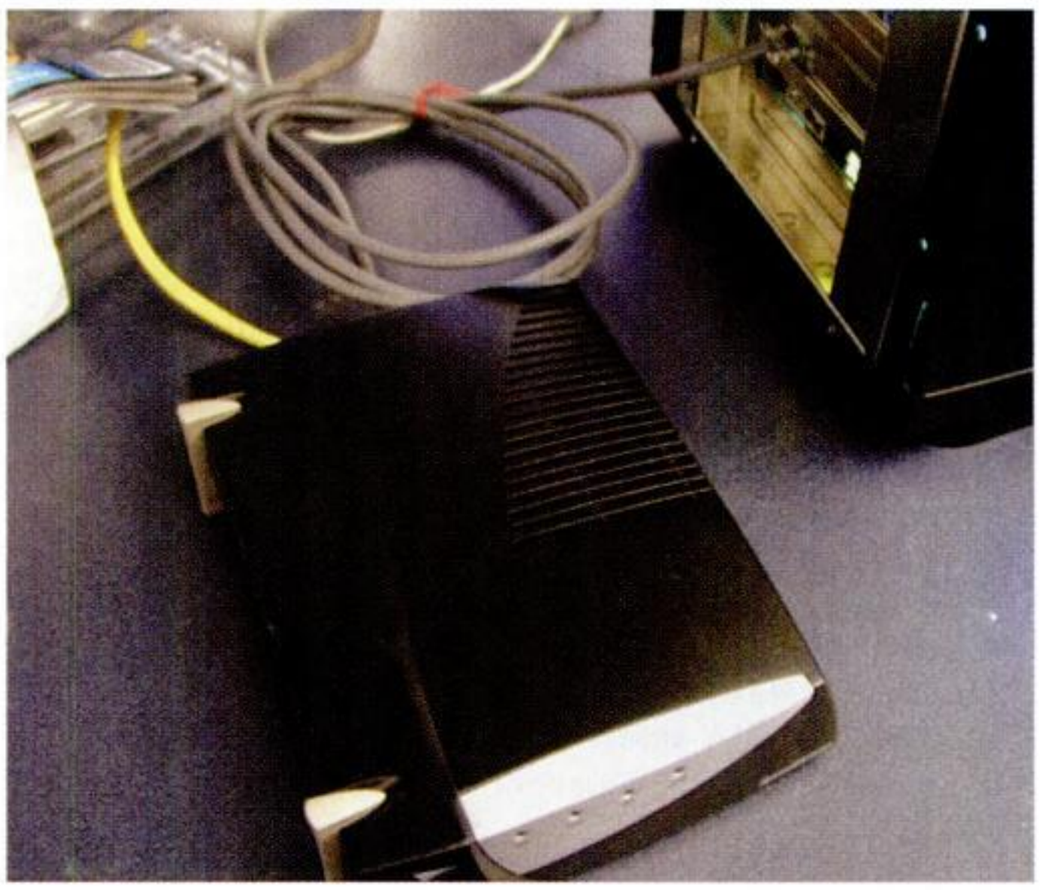
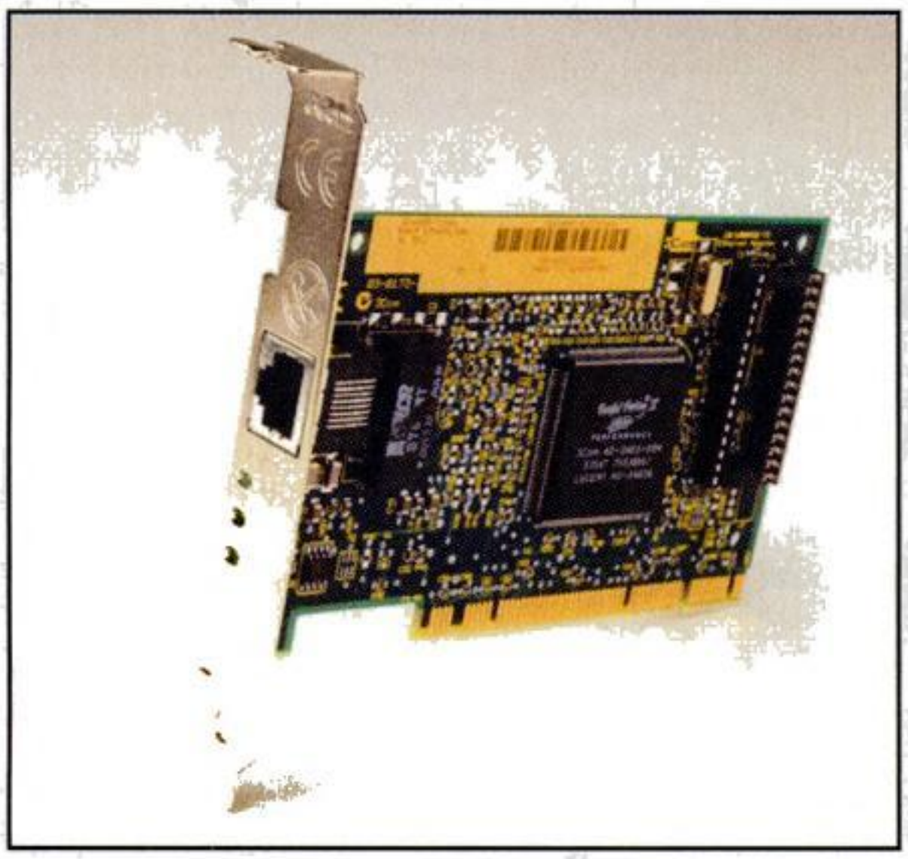
Step 1: Prepare Your Network

This article assumes you're comfortable with Windows-based home networking and have an existing network. We'll assume that you currently have two computers networked and are using a hub to connect them. If you're using a broadband connection, you'll first need to install two NICs in your router box. Remember to verify that those NICs are compatible with *BBI Agent*. You should also make sure your PC has enough PCI or ISA slots to install two NICs. One NIC will be the WAN (wide area network) NIC and will connect to the Internet. The other will be your LAN (local area network) NIC and will connect to your network. Connect the WAN NIC to your cable/DSL modem, and the LAN NIC to the hub/switch. All of your network PCs should also be connected to the hub/switch. For initial setup you should have a monitor and keyboard on the router to configure the PC. Keep a serial port enabled for an external modem if you require dial-up access. Once you have everything connected, turn on the networked PCs and make sure that the lights on all the networked NICs are lit.

Online User Guide: **www.bbiagent.com/en/docs/explorer/000.htm**





Step 2: Configure Your Router's Network Cards

Your router can only include the NICs supported by *BBI Agent*, which is based on the 2.4 Linux kernel. (Any NIC with Windows drivers will work in your desktop machines.) Most NICs bought at BestBuy or CompUSA in the last few years should be supported. See the shopping list for a link to a definitive selection and do your homework first! Your motherboard will also have to be able to support two network cards, which may be an issue with older mobos. Plug-and-play is not supported, so you'll need to change your NIC and BIOS to manually assign their own resources by disabling the PnP OS Option, usually found under "Integrated Peripherals." Install the cards you wish to use into the router computer: Be careful, some older ISA slots are tight. Use firm pressure, but not enough to bend the mobo. You'll temporarily need a monitor and keyboard (or preconfigure the cards in another computer—but that's not recommended) to boot the computer off a DOS disk; use the cards' provided configuration utilities to assign I/O Address and IRQ. The standard DOS-based NIC configuration utility has limited options and is self-explanatory. You can remove the monitor and keyboard once the router is up and running, but some computers don't boot without a keyboard, or lock up once the keyboard is removed.

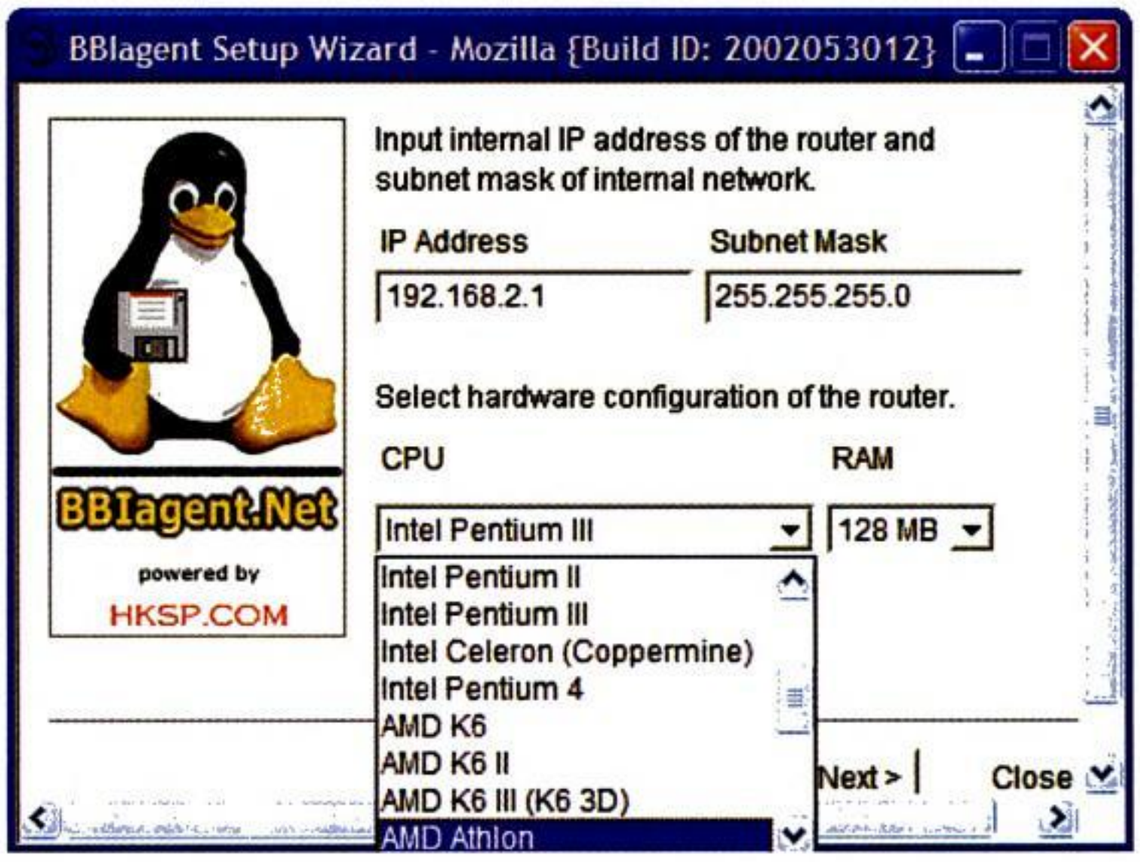
Step 3: Create the Boot Image for Your Router

Now we'll begin configuring and downloading your router's operating system. From any computer with a Java-compatible Internet browser, open **www.bbiagent.com** and click the Download tab. The web site has exhaustive instructions and support on how to set up the floppy boot image, but we'll walk you through the basics and explain what everything means. Scroll down the page, and click Applet (in red text). On the first applet page click Next, then select the type of CPU and amount of RAM used by your router.

The common private IP address ranges are 192.168.x.x and 10.15.x.x. Those addresses are reserved for use on private LANs and can't be accessed by machines on the Internet.

On this screen, you'll also set the IP address and subnet mask of your router. We recommend using 192.168.0.1 as the IP, and 255.255.255.0 as your subnet mask. A subnet mask of 255.255.255.0 will allow about 253 users. A subnet mask of 255.0.0.0 will allow a possible 60,000 machines to connect to the router, but we doubt your machine would support that kind of traffic. The IP address range starting with 192.168 is a private IP, and is for use on private networks only.

After you've chosen your IP address and configured your CPU and RAM info, you're ready to proceed to the next step.



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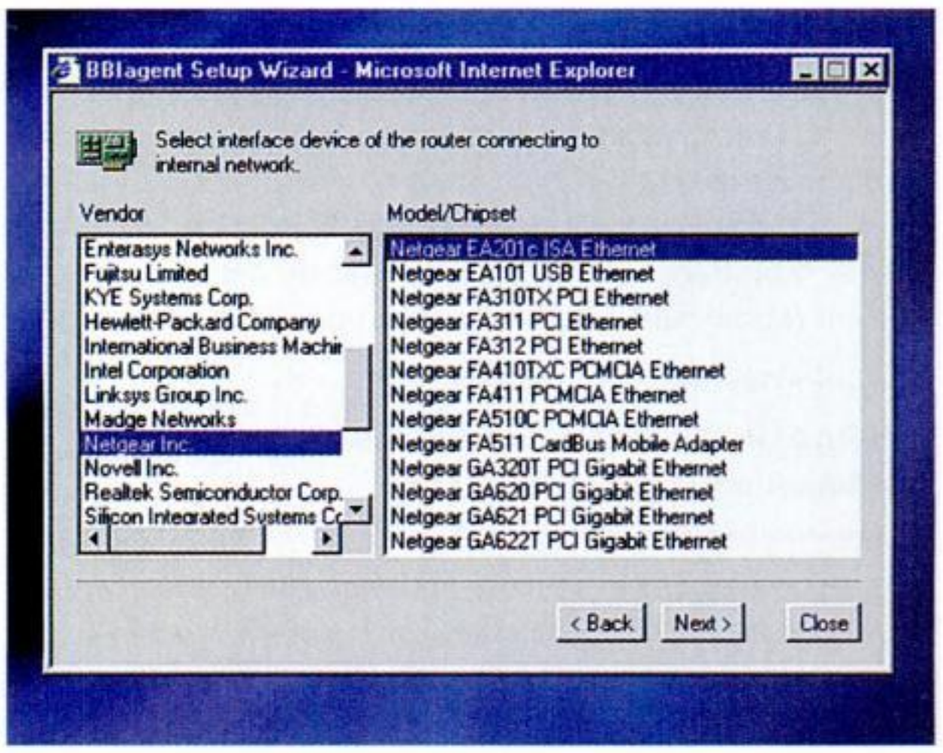
Step 4: Configure Your Router's Connections

Now we need to configure your LAN-side NIC. This is the card that will be plugged into your hub. First, select the card's manufacturer and model. Then set the IRQ and I/O address that either the BIOS assigned or that you configured using the DOS utility in Step 2. Once you've done that, move on to the next screen.

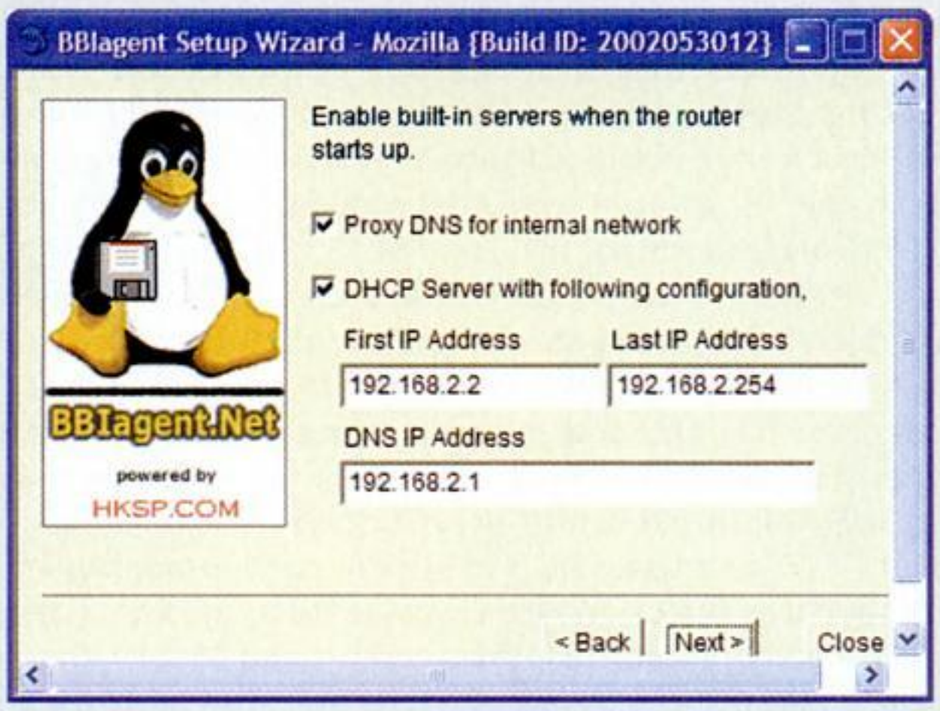
Here you'll want to select your connection protocol. This controls how your PC connects to the Internet via your ISP's network. The most common setup is a standard dynamic IP address assigned via DHCP. If your DSL or cable connection requires you to run a small application that accepts your username and password before you can connect to the Internet, you'll need to choose the PPPoE option. Finally, if your ISP assigned you a static IP address, choose the last option (Ethernet with Static Address).

If you're going to connect to a dial-up connection through the router, you should select the PPP option. If you still aren't sure which protocol to select, ask your ISP. After you click Next, you'll be presented with another config screen that will either configure your WAN-side NIC or your external modem. Follow the instructions on the screen to configure your connection to the Internet.



Sometimes when your net connection isn't working, the problem is the result of a bad DNS server rather than a flawed pipeline to the Internet. In 1997 a small problem with DNS information snowballed into one of the largest Internet outages ever! Most .com and .net addresses were totally unreachable!

Did you select PPPoA instead of PPPoE? You can change the connection protocol in the Administration WAN Connection setup menu once the router is functioning! Groovy!!



Step 5: Configure DNS/DHCP Server & Connection Protocol

The next step allows you to configure some advanced options: DNS proxy/cache and DHCP server. The DNS proxy/cache is really optional, but we recommend it for most people, especially dial-up users. The DHCP server, however, is a must-have and a no-brainer.

The first option on this page is the DNS proxy. A DNS proxy contains a cache that simply stores DNS entries, which are the IP addresses of domain names, such as **www.maximumpc.com**. We recommend enabling the DNS cache for better performance.

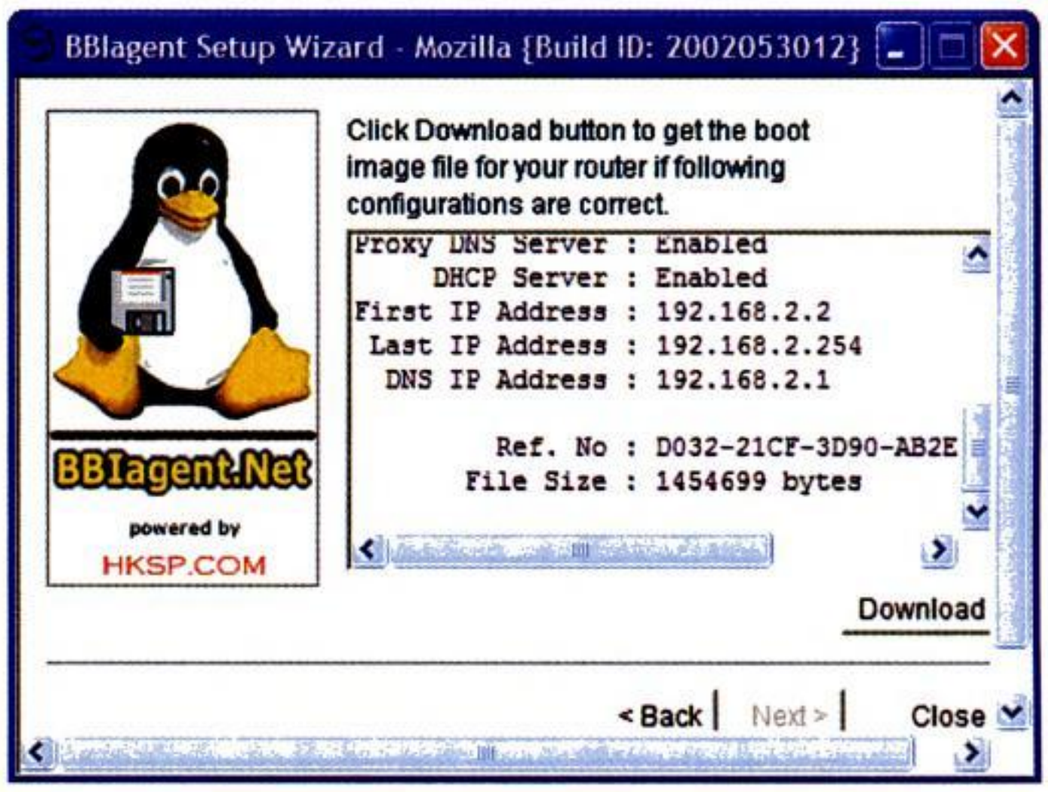
The DHCP server assigns IP addresses to each of the machines on your private network. So unless you want to do that on each machine manually, you'll need to enable the DHCP server.

After you've selected your protocol, click Next to continue.

Step 6: Verify Settings, Download, and Write Floppy Image

We're almost done with the initial config. On this screen, you can verify your settings and download the Linux floppy image. After you click the download button, save the image in a convenient place on your c:\ drive. To write the image to floppy, you'll need BBIwrite.exe for Windows95/98/ME or Rawrite.EXE for DOS. (Head to **www.bbiagent.com** and download them there.) We couldn't get either of the image writing apps to work in Windows XP or 2000, so you'll need to bust out the trusty DOS boot disk again.

All done? Throw the floppy in the router box, power it up, and you're good to go.


BBIagent Setup Wizard - Mozilla {Build ID: 2002053012}
BBIagent.Net
powered by
HKSP.COM
Click Download button to get the boot image file for your router if following configurations are correct.
Proxy DNS Server : Enabled
DHCP Server : Enabled
First IP Address : 192.168.2.2
Last IP Address : 192.168.2.254
DNS IP Address : 192.168.2.1
Ref. No : D032-21CF-3D90-AB2E
File Size : 1454699 bytes
Download
< Back
Next >
Close

How does *BBIAgent* fit everything you need for running a router onto a 1.44MB floppy disk? By running a totally stripped down Linux kernel, devoid of support for 3D acceleration, 2D acceleration, a fancy graphical UI, sound, and anything other than a pair of network cards and *Network Address Translation* software.

In case you didn't know, Linux is an Open Source operating system. Therefore, anyone who wants to can download the source code of the OS and modify it to suit his needs. Of course, you do have to make the source code for any of your modifications publicly available too!

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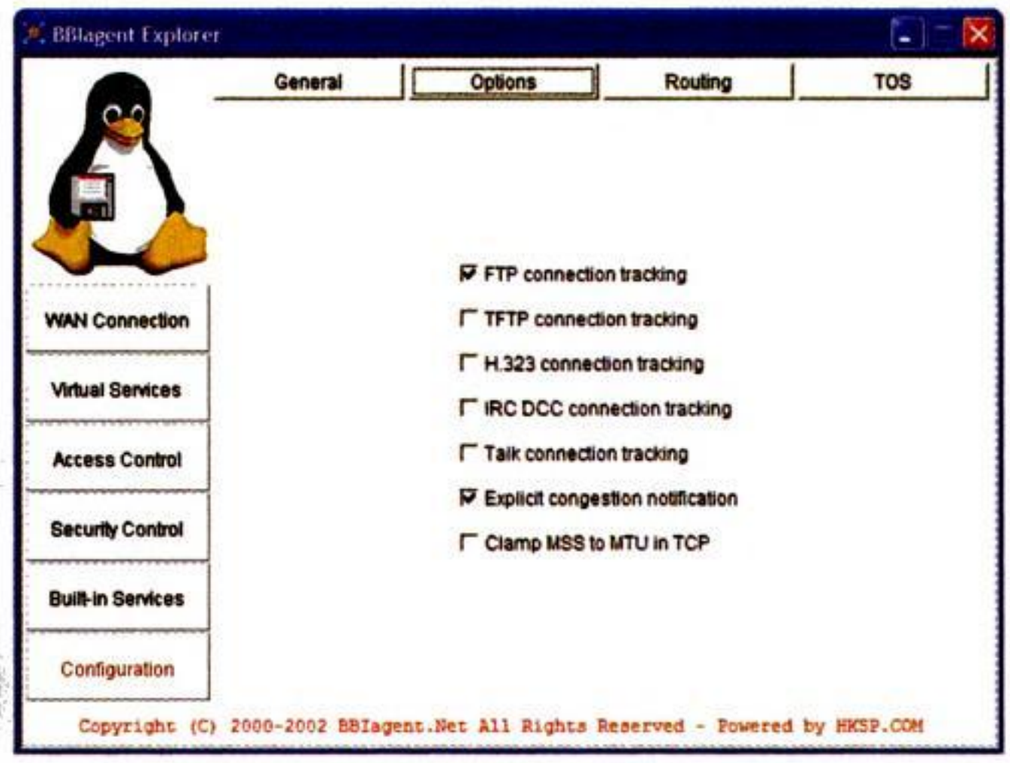
Step 7: Configure the Router

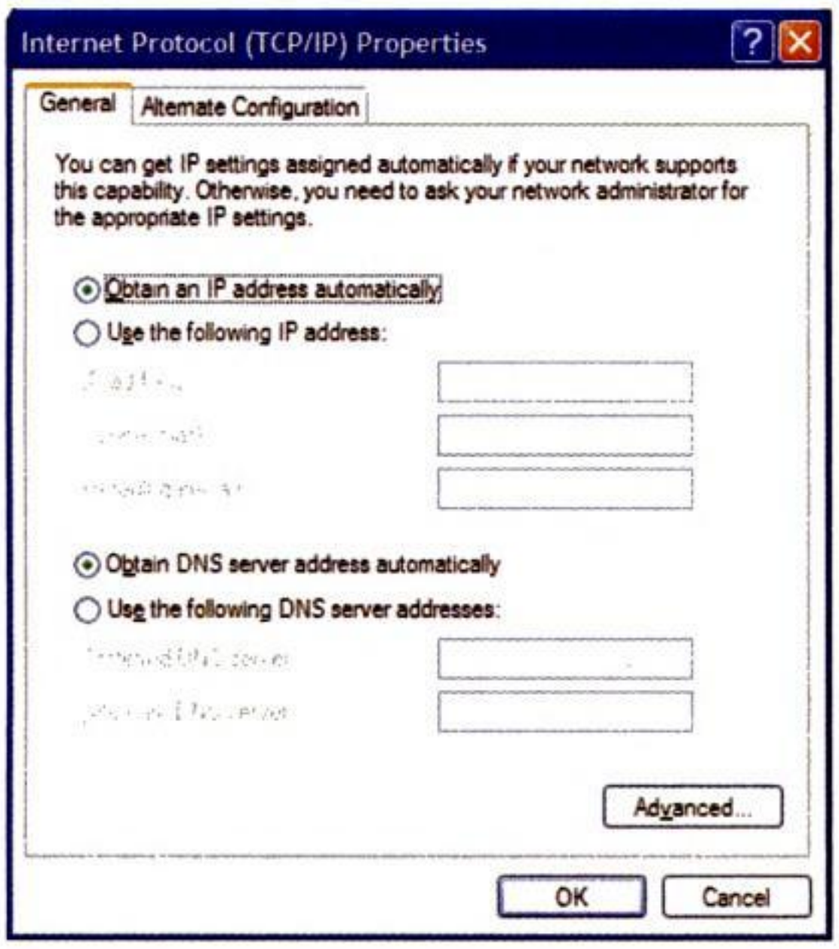
To further configure the router, you'll need to access it via a web browser from another computer. This means you can ditch the monitor and keyboard on the router.

To administer the router, you'll need to download BBIAgent Explorer (BBIAgent.jar) from the BBIAgent site. Once you have the JAR file, enter the router's address in your browser. This will typically be 192.168.0.1. When you get a dialog box requesting the "BBIAgent Explorer" file, browse to it. The default password is "BBIagent."

Once you're in the config app, change your router's password immediately. Go to Configuration, click Password, and change it.

Then click WAN Connection, and it will tell you if the router is configured properly by showing you the IP Address, DNS Server, Default Gateway, etc. The most important part will be configuring any passwords or settings you will need to connect to and communicate with your ISP. Once that information is entered you can select Connect in the Setup menu. From the Administration page you can also establish and set the parameters for any virtual services, such as DNS and DHCP, and you can configure the firewall and security rules. After that, your connection should be good to go! Remember to hit "Save to Diskette" after you make any changes!




Internet Protocol (TCP/IP) Properties
General
Alternate Configuration
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
Obtain DNS server address automatically
Use the following DNS server addresses:
Advanced...
OK
Cancel

Step 8: Set Up Windows Clients

If you enabled the LAN-side DHCP server on the router and your machines are not already set up to accept a DHCP connection, then do so now. To set up DHCP-client in Windows, go to the network properties of the network adapter's TCP/IP setting and select "Obtain IP Address Automatically." If the DHCP server on the router is working properly, you shouldn't have to enter any parameters. You may have to reboot clients for the changes to take effect.

If each of your machines was set up with its own IP address, DNS, and default gateway, then you can safely wipe out all these values after you write them down. The great thing about this router is that it uses *NAT* and includes a packet-inspecting firewall. You shouldn't need any other protection on your network; however, installing personal firewalls on each client is still advisable, as most outbound connections are not blocked, only inbound connections.

Your IP address is not only a unique identifier for your current connection to the net, it also describes where on the net your PC lives. There are about 16 million computers that can share the first number in your IP address, but just 65,000 that can share the first two numbers. Only 256 computers can share the first three numbers.

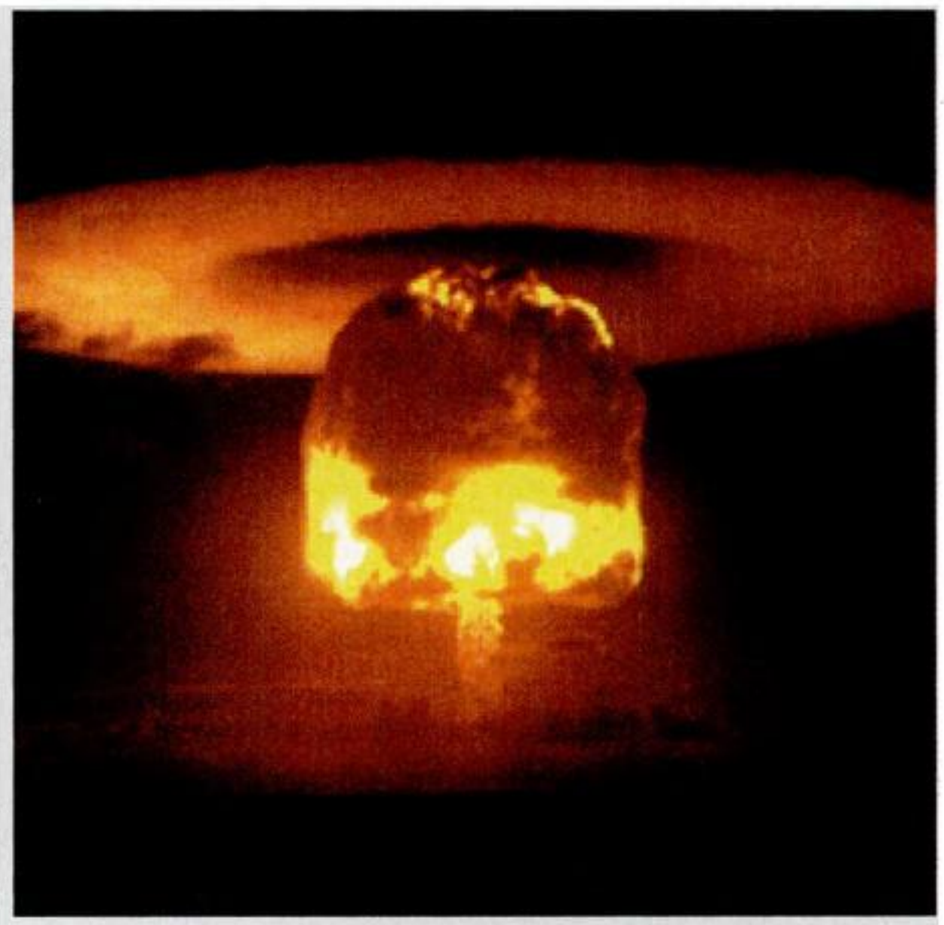
Step 9: In the Event This All Explodes in Your Face...

HKSP (makers of *BBIAgent*) includes on its web site a small Java-based walk-through of the installation and administration of the router. Its customer support is prompt and knowledgeable. Don't be afraid to use it! We've included solutions to some of the most common problems we've encountered:

Burning the floppy image fails or won't start! Windows95/98/ME, MS-DOS, and Linux are the only supported OSes. Grab a DOS boot disk from a friend and use it.

My network cards aren't initializing and/or I get a kernel panic! Recheck your vendor/model selections. Did you set your NICs properly? Set resources that are not used on your computer. Disable any serial ports; leave one if you need dial-up. Change the order of the cards in their slots.

I can't connect to the Internet! Check the WAN Connection settings on the router. If there are IP, DNS, and Gateway entries from the ISP, the router has configured itself. If not, press Connect. If it won't connect, verify that the cable is plugged into the WAN NIC, and that the NIC is initialized properly with the correct driver. Reboot the router and contact your ISP to see if there are any outages. Try switching your network cables. You may have mistakenly associated the wrong NIC with the wrong connection. ■



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How To...

MAKE MP3s LIKE A MASTER AUDIO TECHNICIAN

Only newbies create MP3s with a single mouse click. Here's everything you need to know about ripping and encoding digital music like a true PC power-user

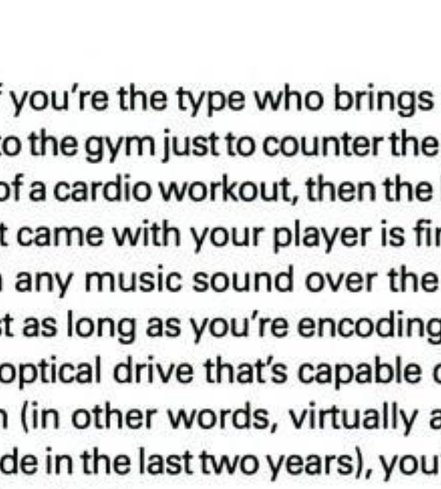
BY LOGAN DECKER

MAXIMUMPC
DIFFICULTY RATING
EASY

If you're the type who brings a portable MP3 player to the gym just to counter the excruciating boredom of a cardio workout, then the MP3 creation software that came with your player is fine. After all, how good can any music sound over the din of a Stairmaster? Just as long as you're encoding at 128kbps and using an optical drive that's capable of digital audio extraction (in other words, virtually any brand-name drive made in the last two years), you'll find nothing to complain about.

But if you want your MP3s to sound as good on your badass stereo system as they do on your solid-state player, you'll need to do more than just reach beyond the 128kbps bitrate minimum. You'll need power-user tools to get the most accurate digital audio extraction, and a high-end encoder that gives you total control over your MP3 compression. The good news is that the software you need is available for free online. First up, audio extraction from mass-produced music CDs. After that, we'll get into the fine details of precision MP3 encoding.

What you'll need:



CD media

Optical drive with C2 error capability

SOFTWARE: Exact Audio Copy, LAME, RazorLAME

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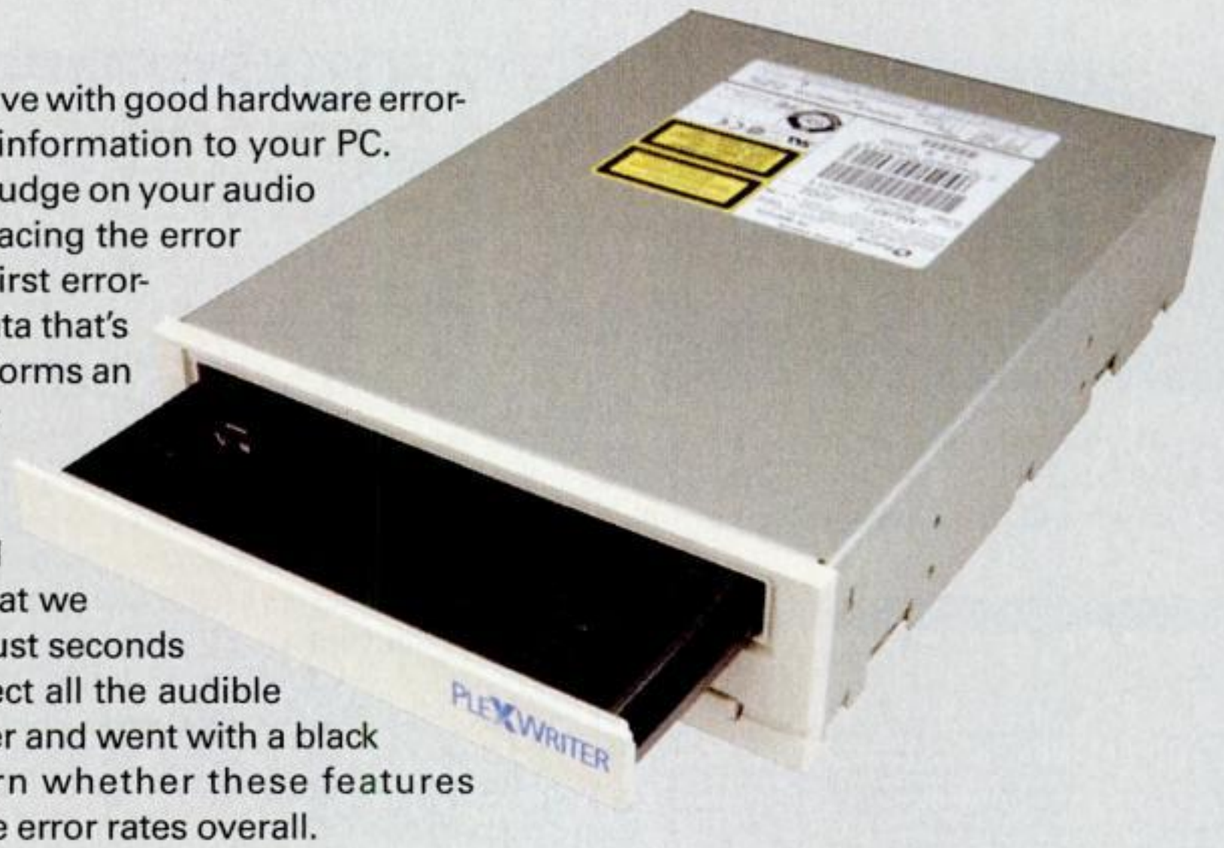
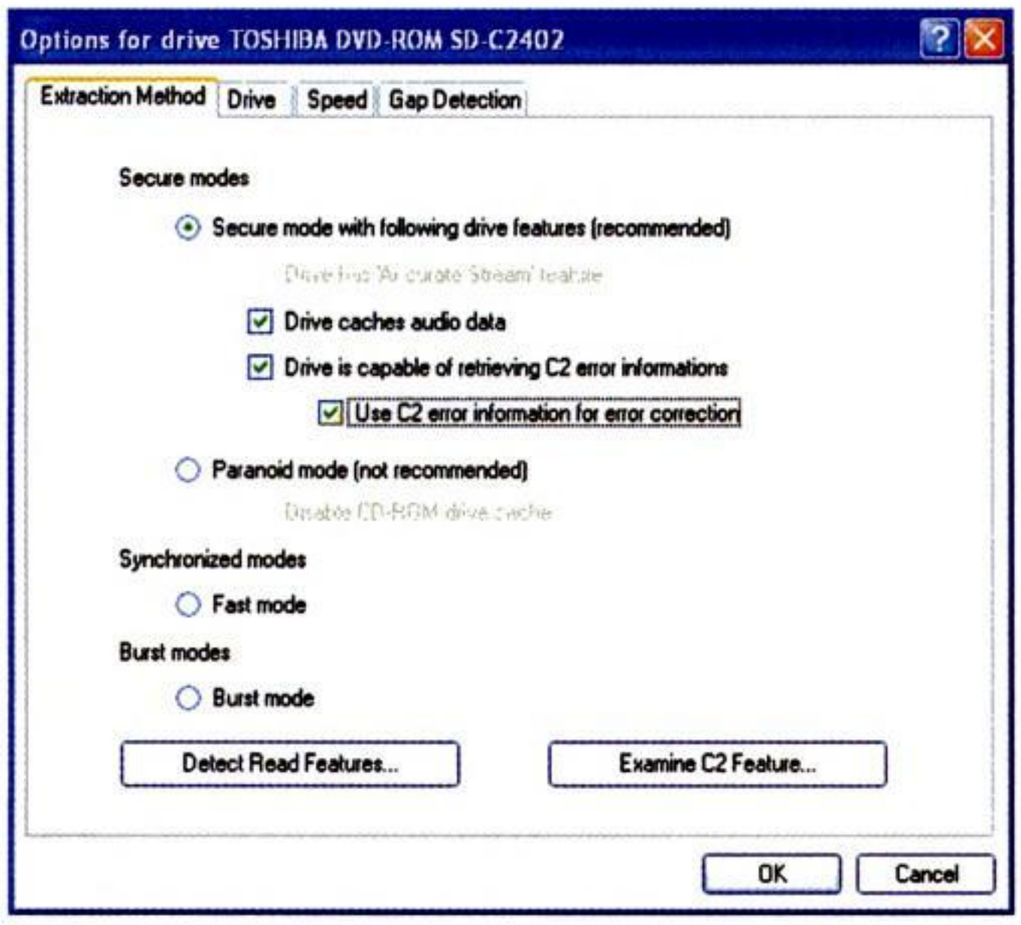
Step 1: Extracting Every Last Drop

Your best defense against extraction errors is an optical drive with good hardware error-correction—specifically a drive that can report C2 error information to your PC. When data is obscured (oftentimes due to a scratch or smudge on your audio CD's surface), an optical drive must compensate by replacing the error with a "best guess" of what belongs there. C1 was the first error-correction scheme; it fills in missing data based on the data that's directly before and after the error. C2 error correction performs an analysis similar to C1 error correction, but across many interleaved frames instead of within just one frame. This makes C2 capable of more accurate data correction.

Our favorite burner is Plextor's 48/24/48, closely followed by Lite-On's 48/12/48. When ripping from an audio CD that we mangled with scissors, Plextor's drive finished the task just seconds faster than the Lite-On, although both managed to correct all the audible errors. Plextor also optimized its circuits for cleaner power and went with a black CD tray to absorb laser light. It's difficult to discern whether these features actually improve CD ripping, but Plextor says they reduce error rates overall.





Step 2: Exact Audio Copy

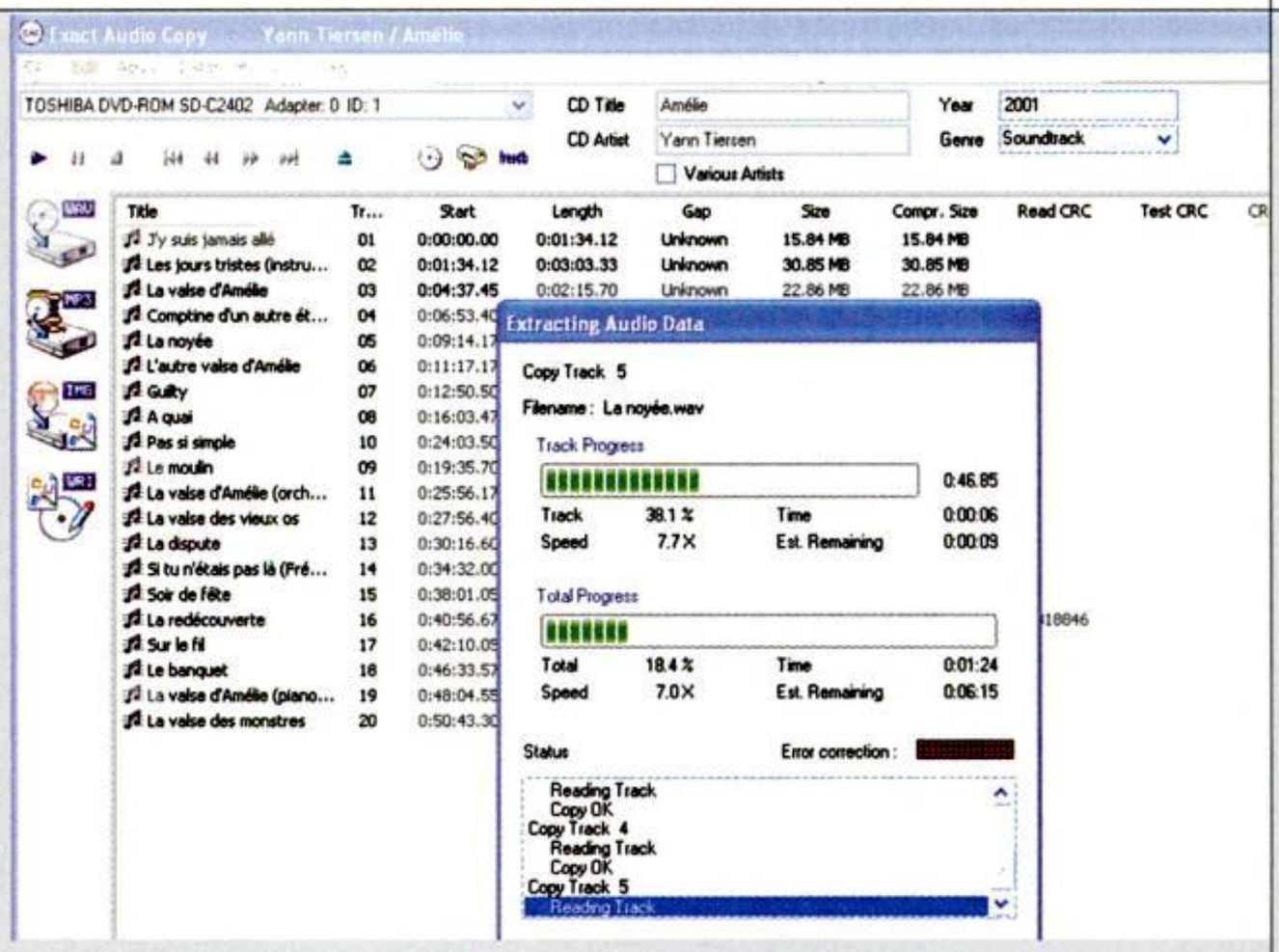
Even if you're using an old 16x burner that doesn't extract every digital bit correctly, you can still get high-quality results using a program called *Exact Audio Copy* (**www.exactaudiocopy.de**). During the install, you'll be prompted to insert an audio CD to test the features of your drive. After the testing is finished, you'll be offered the option of selecting Beginner or Advanced mode. The Advanced options are really advanced, and you're likely to be paralyzed by the astounding number of tech terms and strange settings. There will be plenty of time for experimentation later, so select Beginner mode for now.

It's time to drop in the CD containing the audio you want to extract. Go to EAC > Drive Options. Make sure the Secure mode is checked (it's under the Extraction Method tab). This allows *EAC* to receive information from your drive's advanced error-correction hardware (assuming it's capable of reporting it). Make sure all the boxes you see in the screenshot (to the left) are checked if they're available. Leave the other options alone.

Step 3: And... Action!

Now we're ready to rip. Highlight the tracks you want to extract in the main window, then go to Action > Copy selected tracks, and in the dialog box specify what folder you want the tracks placed in. Don't touch the filename area, even though it says "Filename will be ignored." This advisory is a little misleading: If you don't enter a filename, it will use the track names you see in the main window.

The first thing you'll notice about *EAC* is that it's slow. In fact, extracting a heavily damaged CD can take hours, especially if your hardware has poor error correction. But we're going for quality, not speed. The process is sluggish because *EAC* reads each block a minimum of 16 times, and of those reads, eight must match exactly. It will read and reread your disc, essentially scrubbing the CD for accurate data, until it gets uniform results. If it cannot read the block correctly, then the software will do its best to correct the error, and will report to you which track had a "suspicious position." You can then listen to the track yourself to determine if the error resulted in an audible defect (which often won't be the case).



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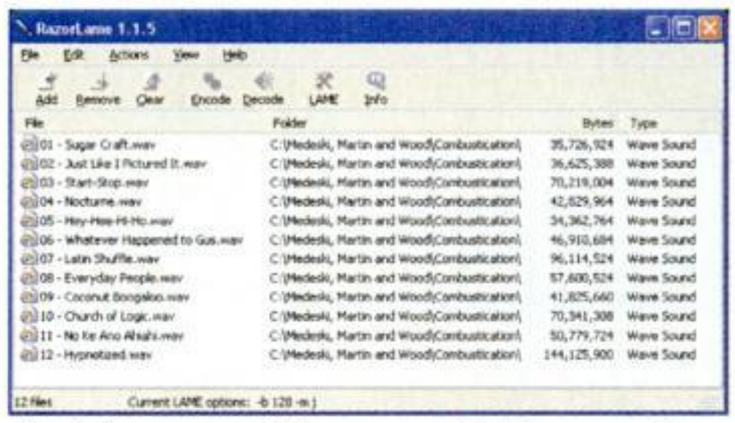
Command Prompt
C:\>lame
LAME version 3.92 MMX
(http://www.mp3dev.org)
(Win32 binaries from: http://www.bat.ee/~engman/mp3/)
Usage: lame [options] <infile> [outfile]
<infile> and/or [outfile] can be "-", which means stdin/stdout.
Try:
"lame --help" for general usage information
or:
"lame --preset help" for information on suggested predefined settings
"lame --alt-preset help" for information on the seperate and very highly
tuned for quality predefined settings
or:
"lame --longhelp"
or "lame -?" for a complete options list
C:\>

This is what you will face if you want to use the DOS-based *LAME* executable on its own. Command line switches...it's not pretty.


RazorLame 1.1.5
File Edit Actions View Help
Add Remove Clear Encode Decode LAME Info
File Folder Bytes Type
01 - Sugar Craft.wav C:\Medeski, Martin and Wood\Combustication\ 35,726,924 Wave Sound
02 - Just Like I Pictured It.wav C:\Medeski, Martin and Wood\Combustication\ 36,625,388 Wave Sound
03 - Start-Stop.wav C:\Medeski, Martin and Wood\Combustication\ 70,219,004 Wave Sound
04 - Nocturne.wav C:\Medeski, Martin and Wood\Combustication\ 42,829,964 Wave Sound
05 - Hey-Hee-Hi-Ho.wav C:\Medeski, Martin and Wood\Combustication\ 34,362,764 Wave Sound
06 - Whatever Happened to Gus.wav C:\Medeski, Martin and Wood\Combustication\ 46,910,684 Wave Sound
07 - Latin Shuffle.wav C:\Medeski, Martin and Wood\Combustication\ 96,114,524 Wave Sound
08 - Everyday People.wav C:\Medeski, Martin and Wood\Combustication\ 57,600,524 Wave Sound
09 - Coconut Boogaloo.wav C:\Medeski, Martin and Wood\Combustication\ 41,825,660 Wave Sound
10 - Church of Logic.wav C:\Medeski, Martin and Wood\Combustication\ 70,341,308 Wave Sound
11 - No Ke Ano Ahahi.wav C:\Medeski, Martin and Wood\Combustication\ 50,779,724 Wave Sound
12 - Hypnotized.wav C:\Medeski, Martin and Wood\Combustication\ 144,125,900 Wave Sound
12 files Current LAME options: -b 128 -m j

Just drag your files—even folders—onto the window, and *RazorLAME* queues them up for you.

Step 4: Put the Squeeze On

Now that you've mastered extraction, you'll want to compress your resulting WAV files in a way that squeezes file sizes down to manageable proportions, with as little negative effect on sound quality as possible. All snooty audiophiles agree that the very best compressor/encoder is *LAME*, a free piece of software that stands for "LAME Ain't an MP3 Encoder." Of course, it really *is* an MP3 encoder, but when it was first released, it couldn't produce MP3 streams. Long story. Anyway, *LAME* on its own is an extremely complicated command line-based executable. If you don't mind entering a lot of text in a DOS box with handfuls of simultaneous switches, go for it. We, however, prefer to pair it up with the friendly GUI front-end called *RazorLAME*.

If the one-click encoder that came with your portable MP3 player is akin to *Microsoft Paint*, then the *LAME/RazorLAME* combination is the equivalent of Adobe *Photoshop*. You can jump in right away and do high-quality encoding without much difficulty, but rest assured, a description of all available sound-tweaking options could fill an entire book.

Download the latest versions of the LAME encoder executable from www.hot.ee/smpman/mp3/ and the RazorLAME front end from www.dors.de/razorlame/docs.php.

***RazorLAME* setup is a piece of cake. Just extract the contents of the ZIP file you downloaded into its own folder, and drop the LAME executable into the same folder.**

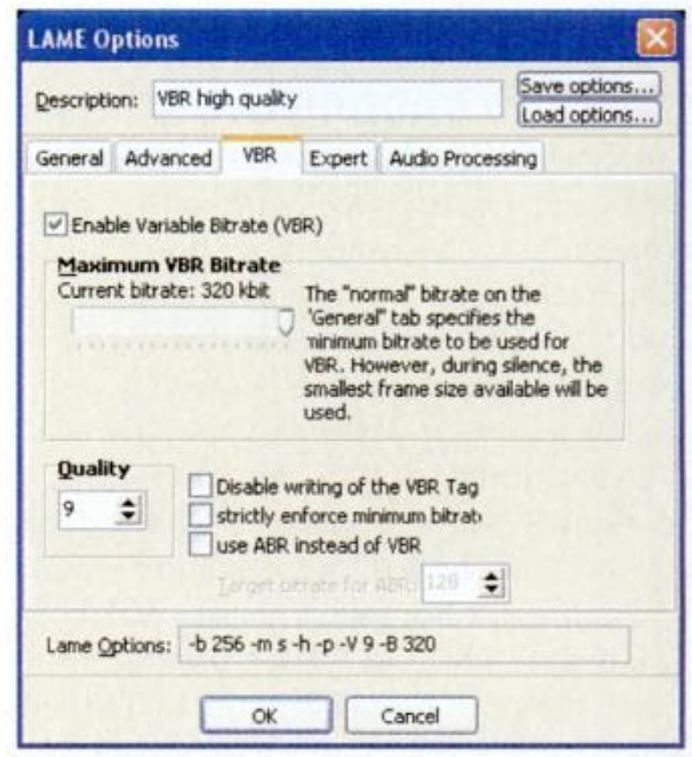
Step 5: Decompression

First, decompress the RazorLAME file into its own folder. There's no install routine, so put it wherever you want. Now open the *LAME* encoder zip file and extract LAME.exe to the same folder (all the other files are administrative documents). Launch the *RazorLAME* executable. At this point, you could easily drag your audio files right into the window and hit Encode. This is what's so great about *RazorLAME*—it takes a command line program and let's you start working right away without touching your keyboard. But we want to customize our settings for MP3 files that will be rendered in absolute high-fidelity on the best stereo equipment....

The "Lame Options" at the bottom of the screen shows you which command line switches have been activated by your preferences.

Step 6: High-End Settings for Hardcore Enthusiasts

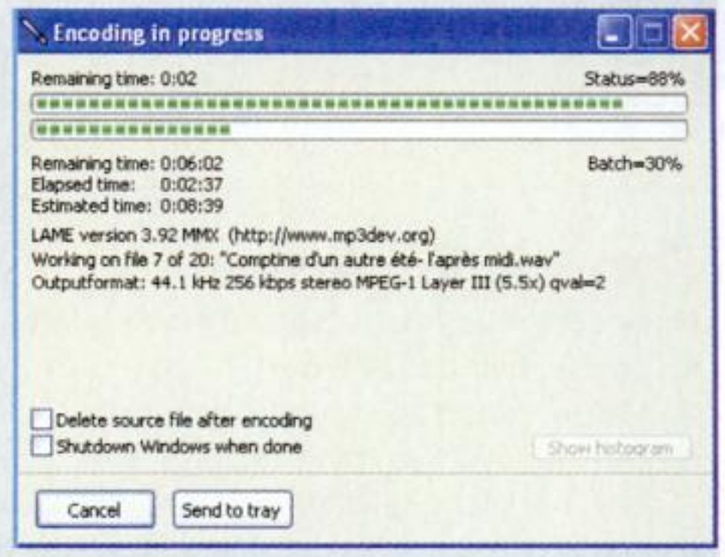
Go to Edit > LAME Options. Here you'll see the familiar bitrate setting. We're going to pull the slider to the right for 256kbps recording. We honestly can't tell the difference between 256kbps and the maximum rate of 320kbps, but if we were encoding classical music with lots of delicate strings, we'd probably default to 320kbps. "Joint Stereo" is the stereo mode by default. Unless you're encoding at 128kbps or below, change this to "Stereo." Joint stereo discards redundant information between the left and right channels. You won't notice the difference at low bitrates, but at higher ones you might begin to notice a swooshing flange effect. (You've probably already noticed this in many crappy MP3 files you've downloaded—well, joint stereo is the culprit.)


LAME Options
Description: VBR high quality
Save options...
Load options...
General Advanced VBR Expert Audio Processing
Enable Variable Bitrate (VBR)
Maximum VBR Bitrate
Current bitrate: 320 kbit
The "normal" bitrate on the 'General' tab specifies the minimum bitrate to be used for VBR. However, during silence, the smallest frame size available will be used.
Quality
9
Disable writing of the VBR Tag
strictly enforce minimum bitrate
use ABR instead of VBR
Target bitrate for ABR: 128
Lame Options: -b 256 -m s -h -p -V 9 -B 320
OK
Cancel

VBR can give you better results than CBR, often at lower file sizes, but may not be compatible with older MP3 players.

Step 7: VBR—Maybe

Now go to the Advanced tab, and under Optimization select "Quality." Do not check "Delete source file after processing" (if your PC hangs during the encoding process, or if you don't like the results, your original files will be toast). If you want, you can select the VBR tab to encode at variable bitrates. In this mode, pauses and silences are encoded at very low bitrates, and complex passages are encoded at the maximum bitrate. Please note that some MP3 hardware players still choke on VBR-encoded MP3s, so we're going to emphasize compatibility for now. Save your options by giving them a descriptive title and clicking "Save options" so you can duplicate the results later without having to memorize all the settings.


Encoding in progress
Remaining time: 0:02
Status=88%
Remaining time: 0:06:02
Batch=30%
Elapsed time: 0:02:37
Estimated time: 0:08:39
LAME version 3.92 MMX (http://www.mp3dev.org)
Working on file 7 of 20: "Comptine d'un autre été- l'après midi.wav"
Outputformat: 44.1 kHz 256 kbps stereo MPEG-1 Layer III (5.5x) qval=2
Delete source file after encoding
Shutdown Windows when done
Show histogram
Cancel
Send to tray

Step 8: Making Music

Now, all you have to do is drag your files (or folders) into the *RazorLAME* window, press Encode, and the program immediately begins grinding out your MP3s. On a slow P-III system, the process could take a long time. But a quick A/B test between your old and new files on a quality stereo system should prove that it's time well spent.

As an added bonus, if *RazorLAME's* status bar indicates that the process is going to take hours, you can select "Shutdown Windows when done" (see screenshot)—even during the encoding process. ■

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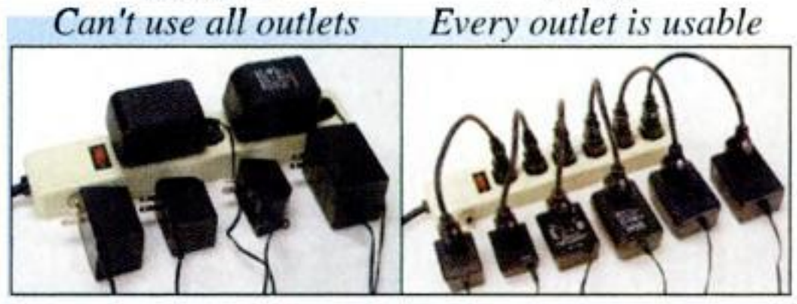

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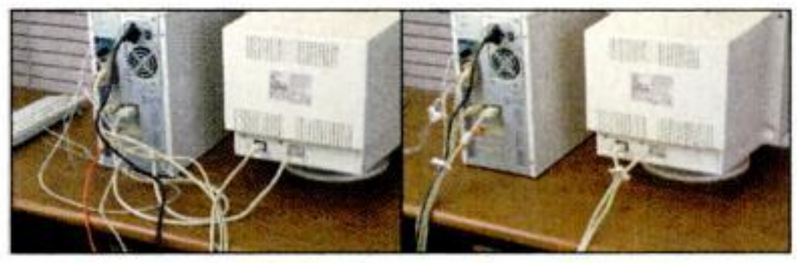

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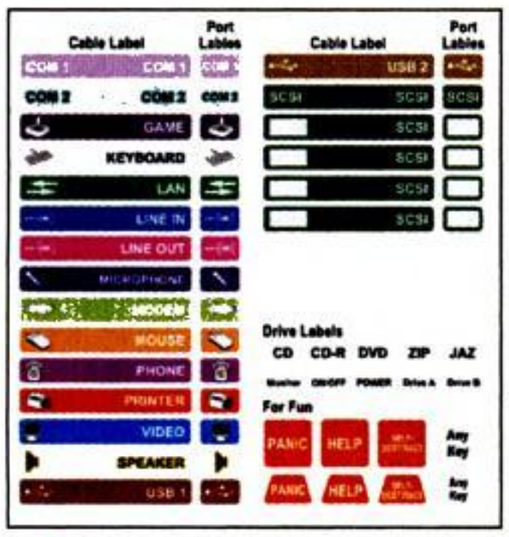

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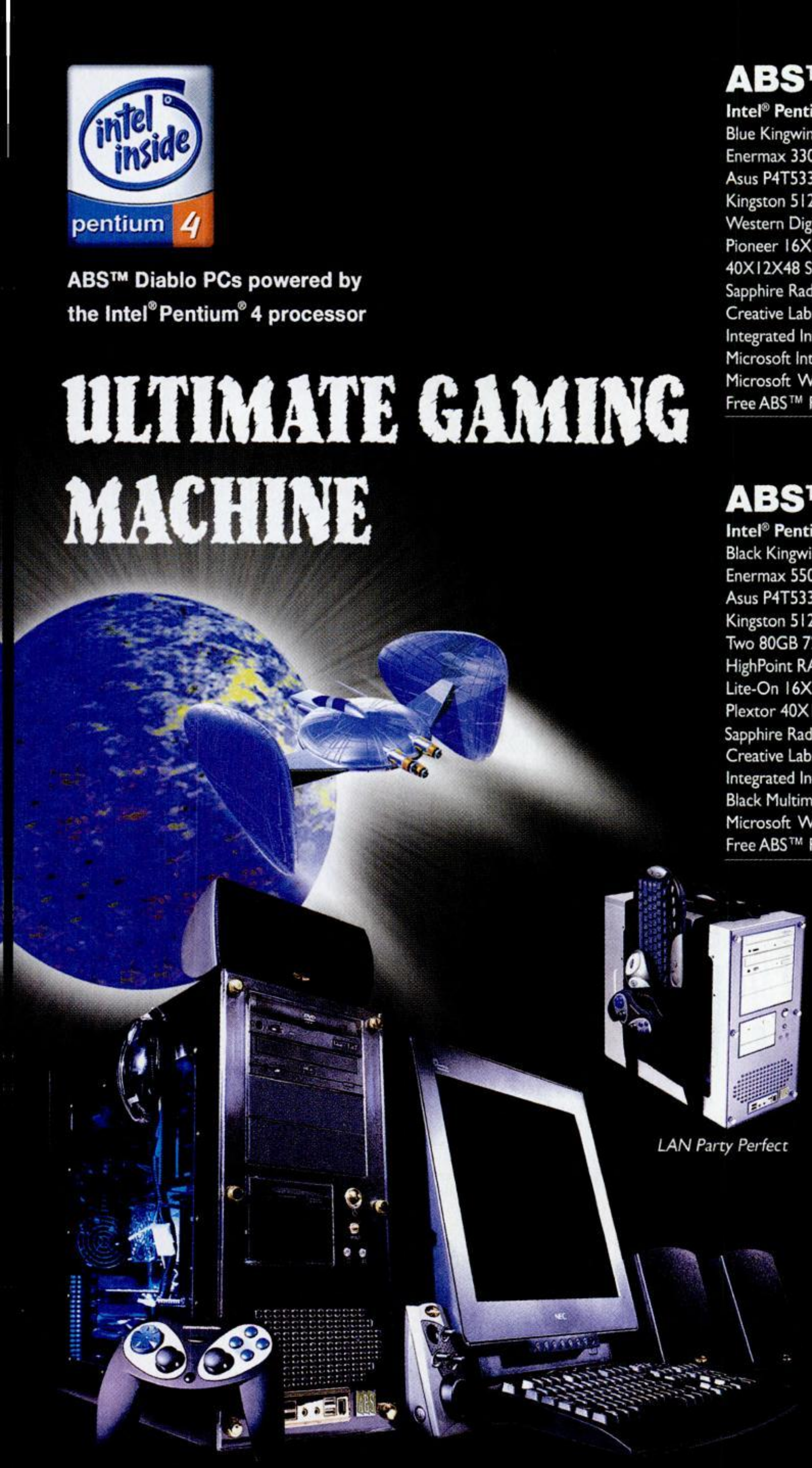

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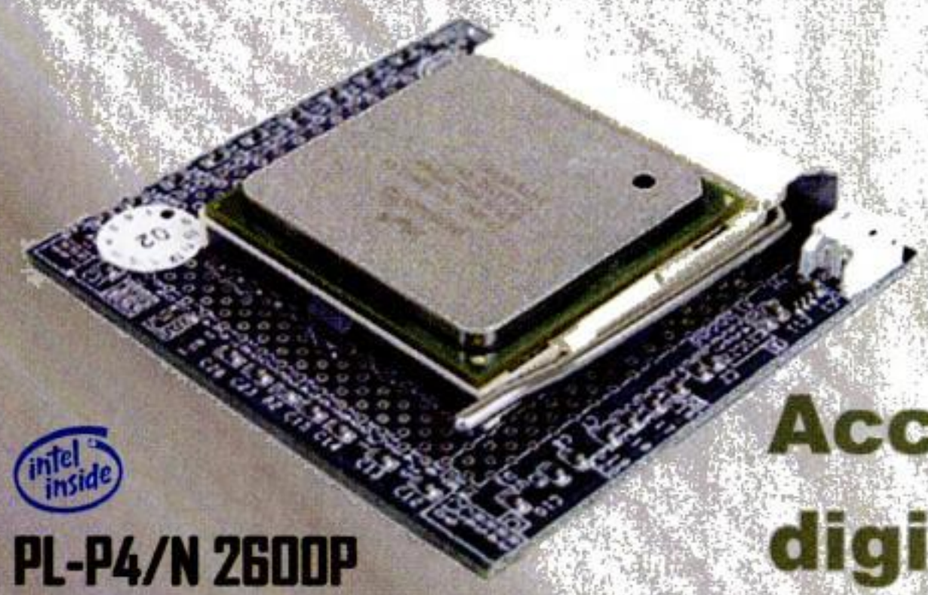

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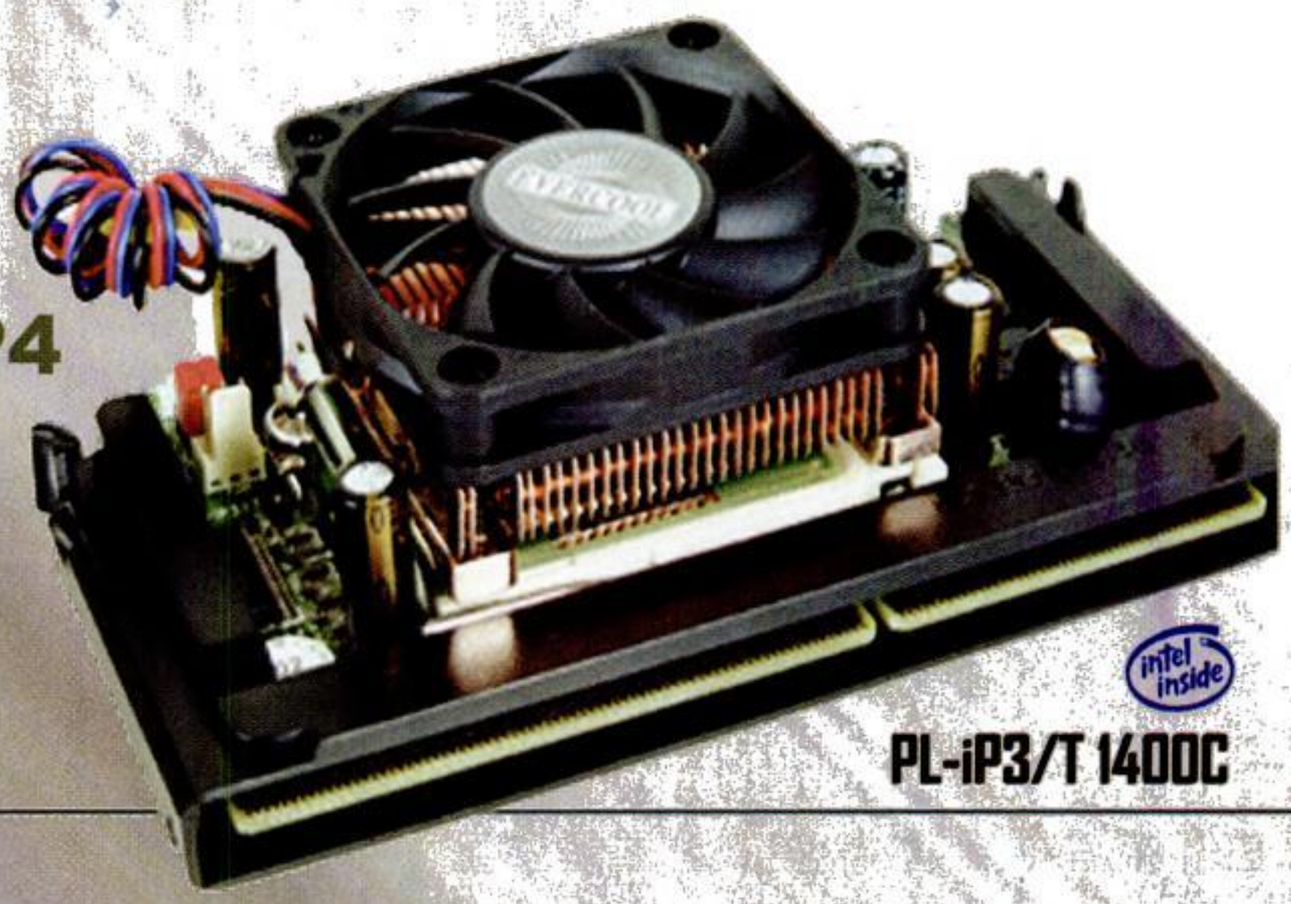

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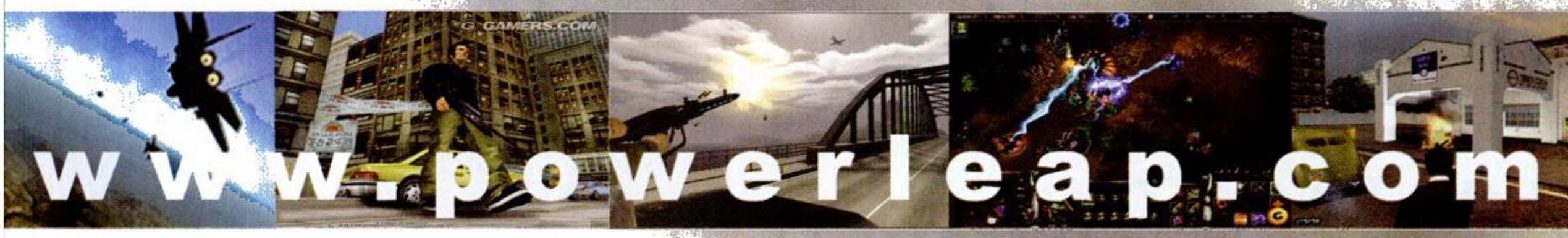

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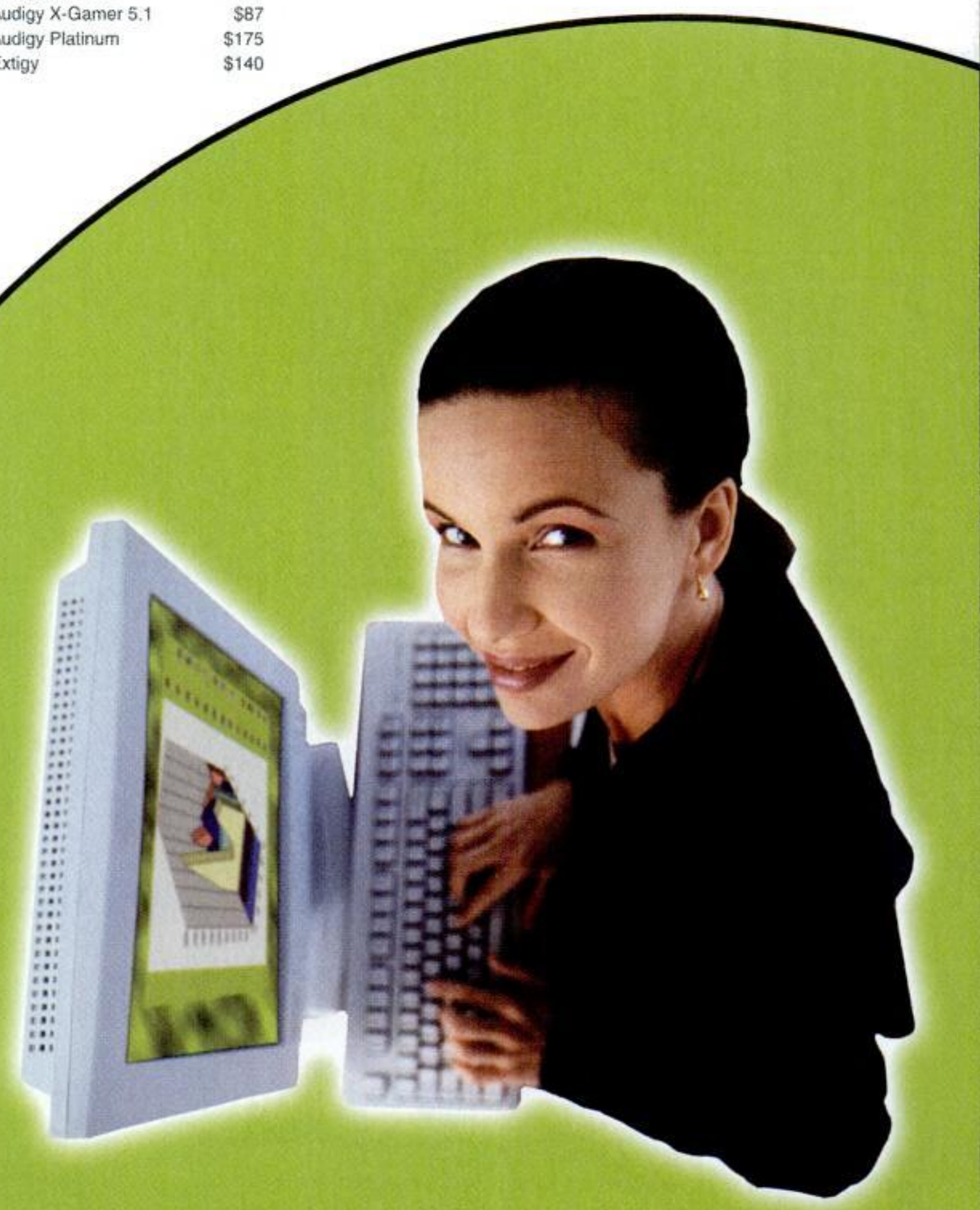

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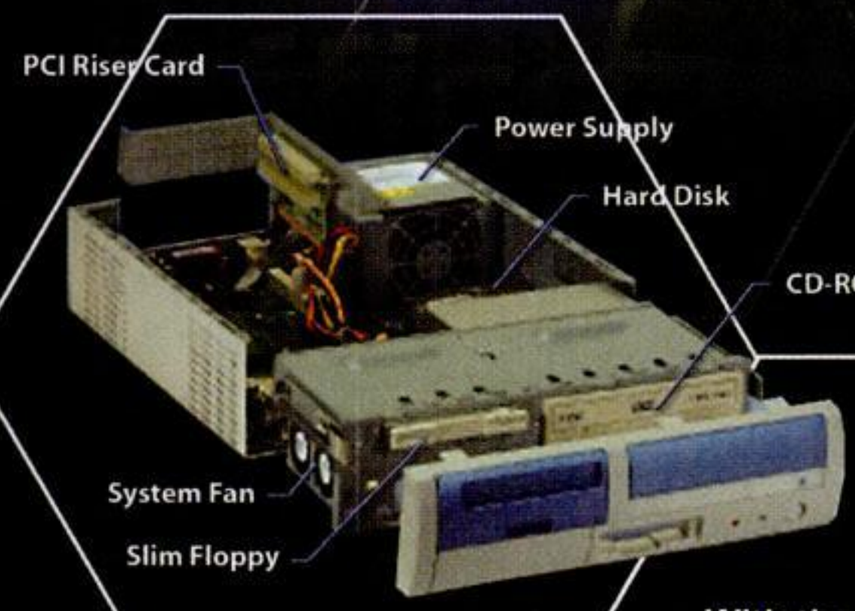

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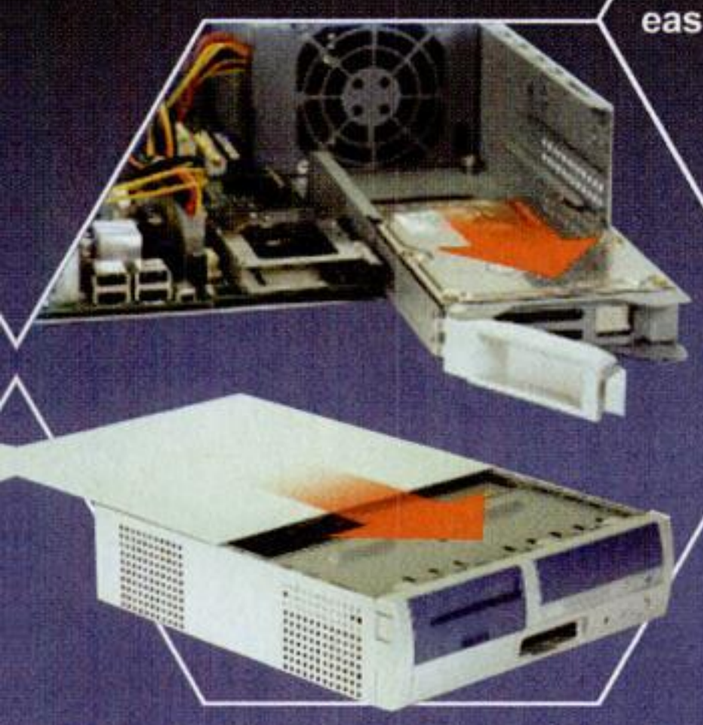

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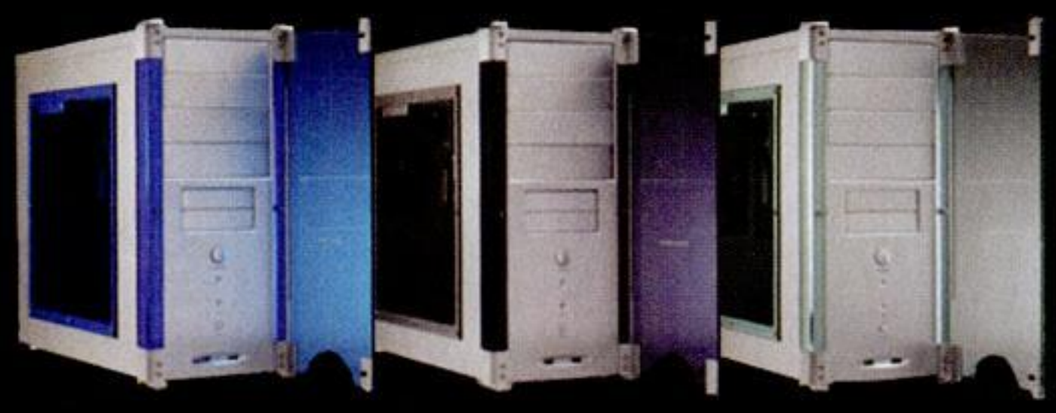

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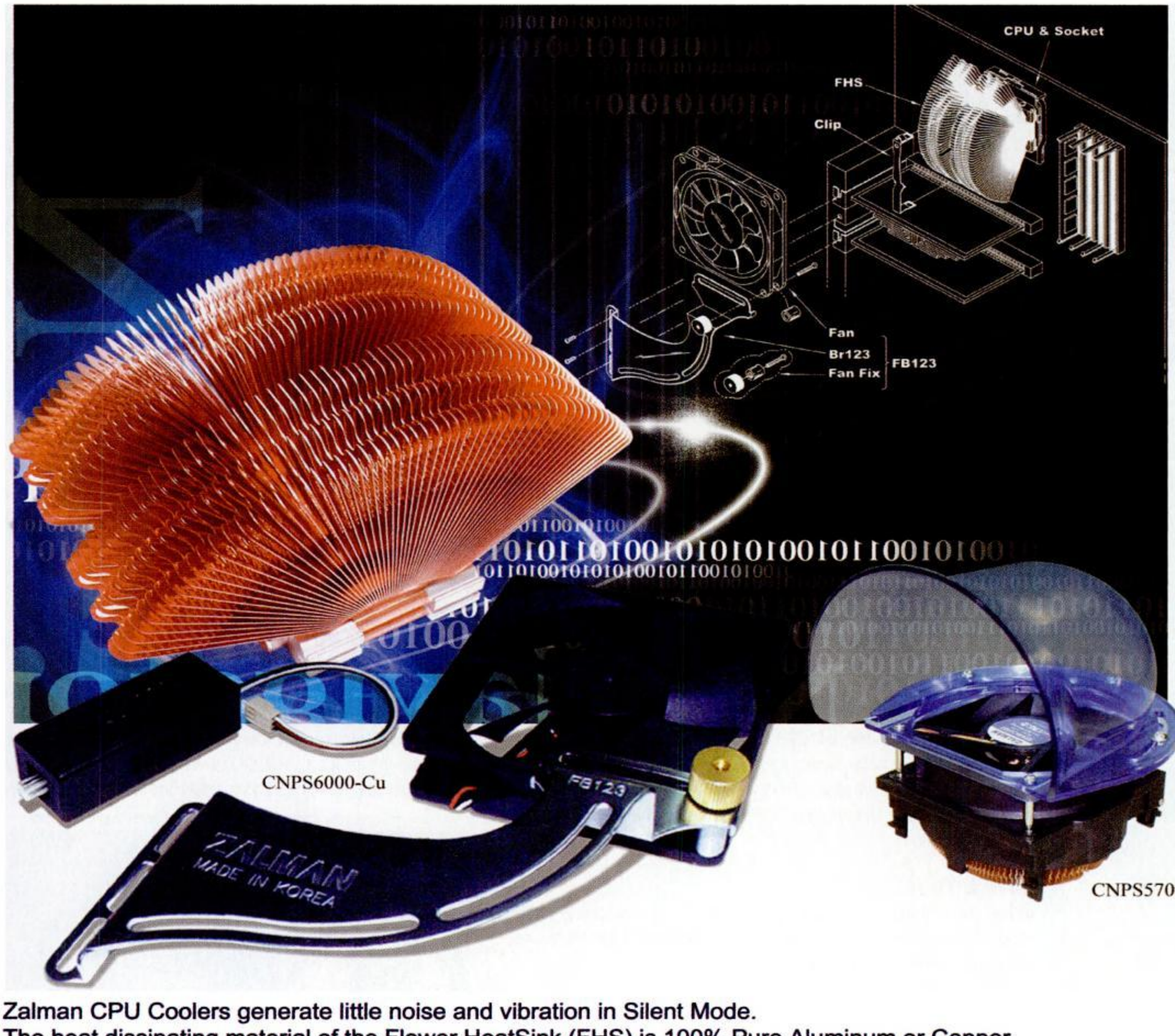

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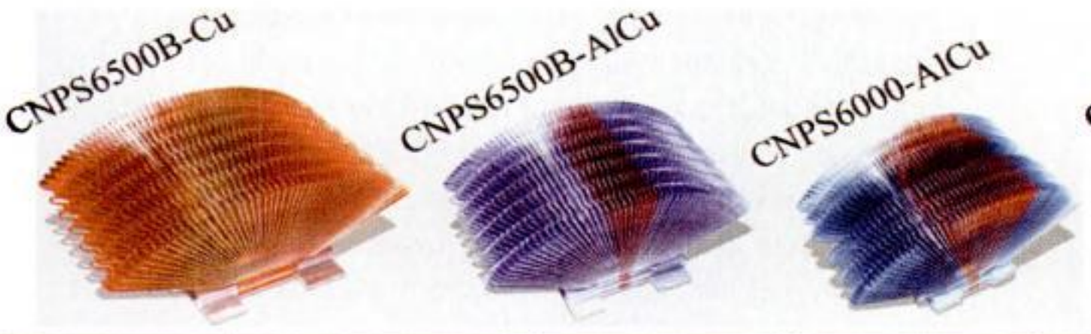

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How To...

KICK ASS AND TAKE NAMES IN FIRST-PERSON SHOOTERS

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SNEAKY SLIMY
RAT-BASTARD

BY WILL SMITH

There is no honor in online first-person shooters. Cheating is rampant, naughty language is the rule, and he who frags best wins the game. So if you're nothing but fragbait, pay attention to the lessons on this page. We can't turn you into the greatest deathmatcher of all time, but we can keep you from living in that permanent vacation home at the bottom of the frag board.

Know Your Enemy's Location

Pay attention to everything around you. Listen closely for footsteps and the sounds of enemies equipping their weapons. Headphones are especially helpful for pinpointing sounds in a 3D space. Also, take care to conceal your position. Walk softly and don't pick up weapons or ammo that you don't need. Those sounds can give you away.

Never Take a Knife to a Gunfight

We call this the Sean Connery Rule. If you come face to face with an enemy and you're low on health, armor, and ammo, you should retreat. Run away, man! Run like the wind! Re-equip yourself, *then* attack. On the flipside, never hesitate to finish off a weakened enemy. Sure, it's not a fair fight, but what do you care? A frag's a frag.

Master the Circle Strafe

By using your mouse for aiming and your movement keys to step left and right, you can circle an enemy while always keeping your weapon on-target. Practice on bots, then take your mad strafing skills to more intelligent prey.

Check Your Corners

When you're entering a new room, make sure no one is lurking in the corners before you completely expose yourself. Remember, these are 3D games, so look up and down too.

Control Yourself

That craptastic mouse that came with your PC just won't cut it for a firefight, so get yourself a real weapon like the Microsoft Intellimouse Explorer or the Logitech MX700. Just make sure to try before you buy. Once you have your mouse, experiment with the cursor speed and acceleration settings to determine what works best for your play style. Snipers might want the high precision of a low mouse speed, while run-and-gun fraggers usually prefer a higher speed. You might also try disabling mouse acceleration for more predictable aim.

Get Down with the Lingo

The language of the online FPS community, or l33tspeak, is frightening and difficult to master. If you say the wrong thing, you'll be marked as a n00b (newbie player) and targeted for easy frags. Here are some phrases that should help you fit in: "y0 bish, I totally pwned j00!" (Hey, man, I really kicked your butt just then.); "j00 are mah bish" (I can frag you wherever and whenever I like.); "y u h8 me?" (Why do you kill me over and over?)

Caution: If you can't master this phraseology with utmost fluency, we recommend against using l33tspeak at all. It's better to be silent and thought a fool than to open your mouth and prove it.

Basic Rules for Team Games

DO NOT SHOOT YOUR TEAMMATES. If you're playing on a teamplay server, the object is to beat the other team. You will not beat the other team if you spend your time shooting your teammates in the back. Even if your squad is trudging across Iwo Jima in *Battlefield 1942* and you haven't seen an enemy for 10 minutes, it's not acceptable to unload into your pal.

Set Up an Ambush

Whether you're playing in a team game or in an online fragfest, setting up an ambush is a time-honored tradition in FPSes. Go to a key area of the map—it can be a weapon spawn, an ammo dump, or just a choke point between two objectives—and find a nice dark corner to wait in. When an enemy approaches, wait until you've lined up a sure shot, then frag 'em. The losers call it camping, but we call it winning. Advanced tip: It's a good idea to set up on an enemy spawn spot. Even the best deathmatcher is disoriented and weak after respawning!

How-To Win at Unreal Tournament 2003

Some guns rock, some will get you rocked. Use the flak cannon, the shock rifle, and the lightning gun to kill your enemies quickly. When your adrenaline meter hits full, you can perform combos to give you special powers. To speed up, tap move-forward four times quickly. To regen your health, tap move-backward four times quickly. Try right, right, left, left and forward, forward, back, back for more fun. This game demo is included on the disc, so give it a try!

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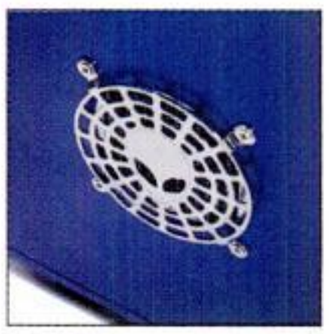

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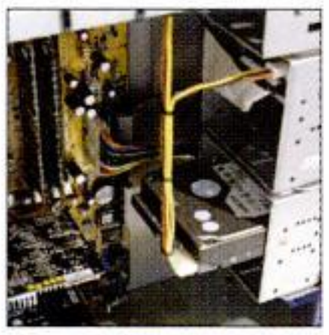

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Is There Life Beyond Gaming?

So how does a system built for gaming perform in other tasks? The most demanding tasks a computer system can perform are those which involve complex graphic and video calculations. As a result, a system built for gaming performs above and beyond any standard system's expectations.

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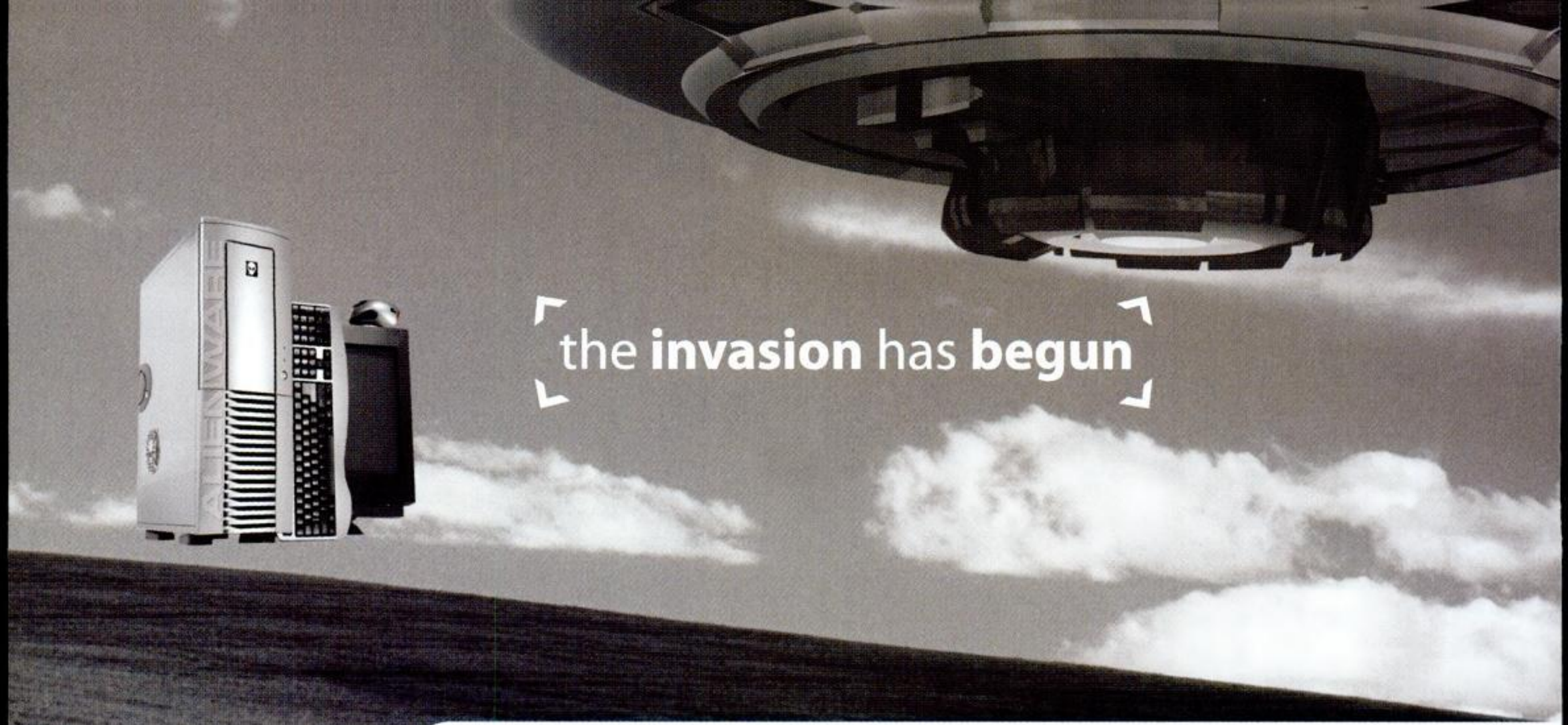

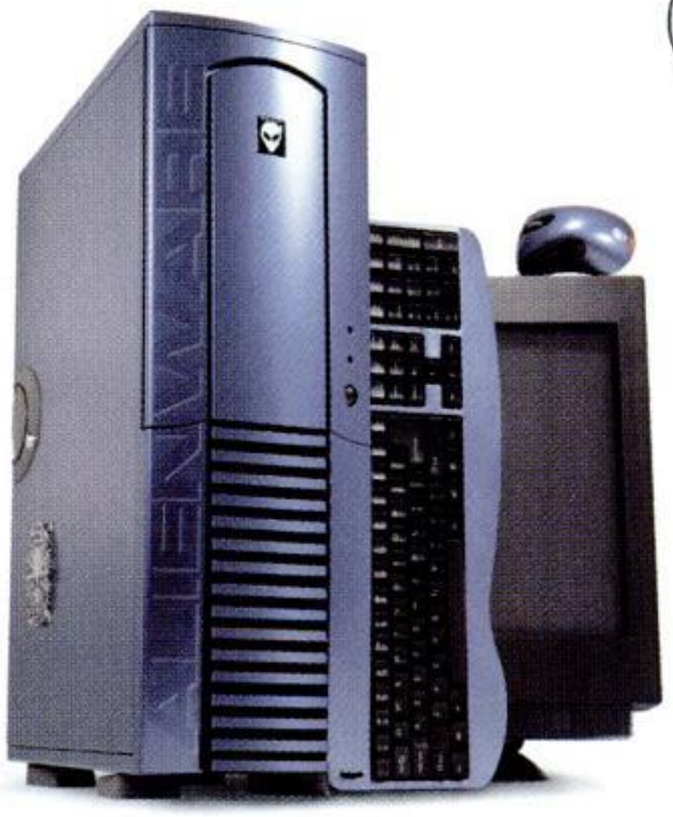

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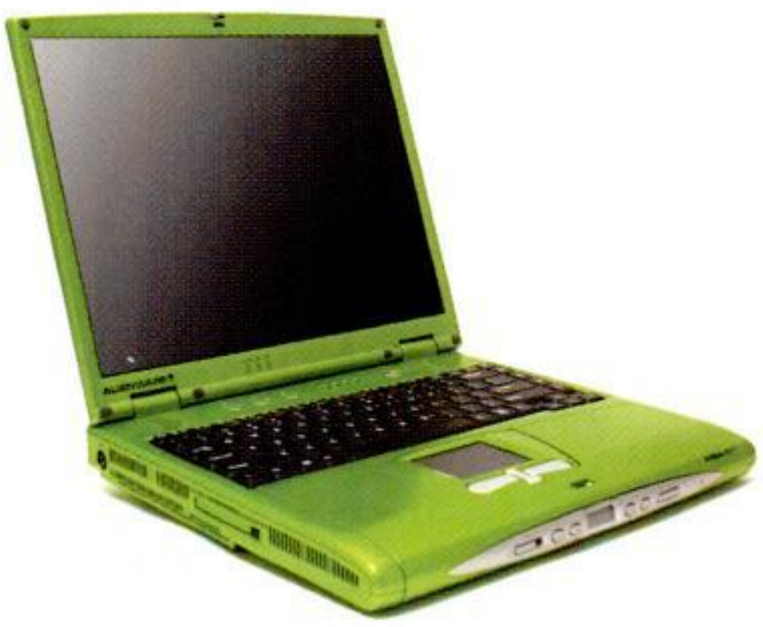

Area-51m™: Mobile Gaming

The Area-51m™ represents the first fully capable mobile gaming solution. The performance requirements of today's most cutting edge games have been simply too demanding for a laptop unit, until now. The Area-51m™ plays games at blistering speeds, handles quick motion with incredible accuracy, and performs phenomenally high in benchmarks. Perfect for LAN parties and for those who simply cannot part from their desktop system's performance, the Area-51m™ is the ultimate mobile gaming machine™.

AREA-51m™ MOBILE GAMING

Intel® Pentium® 4 Processor at 2.8GHz with 533 FSB and 512KB Advanced Transfer Cache
High-Performance Heatsink/Cooling with Arctic Silver III
Intel® 845MP+ ICH3M Chipset Motherboard
512MB PC-2100 DDR SDRAM
Exclusive Metallic Cyborg Green Laptop Chassis
40GB 5400RPM Ultra ATA100 Hard Drive
15.0" UltraXGA+ TFT Active Matrix LCD
ATI® Mobility RADEON™ 9000 PRO 64MB DDR
with Dual-View Display Monitor and TV-out
AlienAdrenaline: Video Performance Optimizer
Removable 3.5" Floppy Drive 1.44MB
Removable 24X/10X/24X CD-RW/8X DVD Combo Drive
Sound Blaster® PRO Compatible with Wavetable
5.1 3D Surround Sound with S/PDIF Digital Output
Front Panel Audio DJ CD Player
Allows CD Play While System is On or Off
One Type II PCMCIA Slot
Four USB 2.0 Ports and One IEEE 1394 Port
Infrared Wireless Fast IR Interface
10/100Mb Ethernet LAN and 56K Modem
Dimensions: (H) x (W) x (D) : 1.7" x 13" x 11.4"
Weight: 7.6lbs. without battery
Exclusive 120-Watt A/C Adapter
Microsoft® Windows® XP Home Edition
1-Year Toll-Free 24/7 Technical Support
with Aliencare On-Site Home Service
AlienAutopsy: Automated Technical Support
Personalized Owner's Manual
FREE Exclusive Alienware® T-Shirt
FREE Custom Alienware® Mouse Pad
Optimized & Configured for High-Performance

$2,999.00

Laptops available in custom metallic colors!

ALIENWARE®

Custom Build your Dream Machine at **WWW.ALIENWARE.COM**
For More Information Call Toll-Free: 800.494.3382

Alienware® recommends Microsoft® Windows® XP Professional for Mobile Computing.

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